BODY, SENSES & ARCHITECTURE

Carving a Volume into the World of Darkness
CONTENTS

INTRODUCTION 1

CHAPTER 1: SENSES 5

Vision 7
  Shadows 9
  Vision and Architecture 10

Hearing 13
  London Underground 16
  Bells 17
  Noise 19
  Privatized Soundscape 25
  Sound and Architecture 29

Touch 31
  Tactile and Materialization 33
  Braille 35
  “Land of Silence and Darkness,” Film by Werner Herzog 36

Scent 41

Taste 43

Body, Dimension and Scale 45

CHAPTER 2: WAYFINDING 53

Sighted 55
  Labyrinths and Disorientation
  Labyrinths in Ancient Cities 57
Spatial Orientation and Wayfinding  
Accuracy on Orientation  
Cognitive Maps  
Cognitive Distortion

**Blind**

Wayfinding Methodology  
Blind Baby’s and Recently Blinded Adult’s Wayfinding Development  
Wayfinding without Vision: An Experiment with Congenitally Totally Blind People, experiment by Romedi Passini and Guyltne Proulx  
Echolocation  
A Blind Traveller

**CHAPTER 3: SENSUAL PROJECTS**

**Exhibitions**

Biomapping Workshop  
Dialogue in the Dark  
Dialogue in Silence  
Bartimeus’ Lunch in the Dark and The Dark Perceptional Space  
Olafur Eliasson’s The Mediated Motion (2001)  
Olafur Eliasson’s The Weather Project (2003)

**Historical Sensory Projects**

Ancient Greek and Roman Theatres  
Medieval Cathedrals  
Theatre Design: Italian Renaissance Theatre and The Symphony Hall in Boston (1900)

**Modern Sensory Projects**

The Sonsbeek Pavilion by Aldo van Eyck
INTRODUCTION

The domination on vision and elimination of other senses will lead to increase the sense of detachment and alienation. When one places the body as the tool to experience the space, he or she will enter the world of interacting senses.

I confront the city with my body; my legs measure the length of the arcade and the width of the square; my gaze unconsciously projects my body onto the façade of the cathedral, where it roams over the mouldings and contours, sensing the size of recesses and projections; my body weight meets the mass of the cathedral door; and my hand grasps the door pull as I enter the dark void behind. I experience myself in the city, and the city exists through my embodied experience. The city and my body supplement and define each other.¹

The role of the body is essential to understand the spatial formation. “Our bodies and movements are in constant interaction with the environment; the world and the self inform and redefine each other constantly.”² With the interactions between body, imagination and environment in the architectural experience, one will eventually gain some memories in every place he or she has visited. As “the eye collaborates with the body and the other senses, one’s sense of reality is strengthened and articulated by this interaction of the senses.”³ In other words, when the architectural experience becomes multi-sensory, all the senses are equally experiencing the quality of the space, which will strengthen the existential experience.

Architecture is essentially an extension of nature into the man-made realm, providing the ground for perception and the horizon to experience and understand the world. It is not an isolated and self-sufficient artefact; it directs our attention and existential experience to wider horizons.⁴

The psychologist, J. J. Gibson, had categorised the five sensory systems: visual system, auditory system, the haptic system, the taste-smell system, and the basic-orienting system.⁵ Vision is considered as the extension of touch. “The senses define the interface between the skin and the world, the interface between the opaque interiority of the body and the exteriority of the world.”⁶ However, what will it be like in the world of blindness? What is blindness?

² Juhani Pallasmaa, Idem, 27.
³ Juhani Pallasmaa, Idem, 28.
⁴ Idem.
⁵ Juhani Pallasmaa, Idem, 29.
⁶ Idem.
From the perspective of John M. Hull, who is once sighted, there are 4 psychological stages in the process of blindness. He stated:

First I believed that blindness was when you couldn’t see because something had gone wrong with your eyes. Then I understood that blindness was a deprivation of knowledge for which alternative sources and kinds of knowledge would compensate. Gradually I came to see that blindness is a whole-body condition. It is not simply that your eyes have ceased to function; your whole body undergoes a profound transformation in its relationship to the world. Finally, I came to believe that blindness is a world-creating condition.7

Once a person lost the sight, he or she will gain a new consciousness. At first, one will fall into the darkness. During the journey of darkness, it is never totally pitch darkness in terms of color. It is proven that blind people can sense a minimum amount of flashing lights and some bluely-grey shades. Once the blind person has gained more experience through numerous obstacles without sight, then he or she will eventually become more consciousness. From the experience of Hull, he can only describe his journey of consciousness “through the presentation of a series of fragments. The thing itself is not fragmented but the path to it is experienced fragmentarily.”8 In terms of the sighted people, visual memories, impressions and knowledge are always playing the dominant roles in consciousness. Even when the eyes are closed, imaginations are formed from colors, shapes, sizes and movements in reality. On the other hand, for the blind, consciousness is the experience of darkness without any information from colors, shape and movement. It is purely obtained from touched and heard.9 “In the moments of emotional anxiety, this becomes an awareness of ignorance, a consciousness of darkness. It is not just that one cannot see; one is plunged into darkness.”10 The sinking into darkness is pierced by the gaining of knowledge. It is the knowledge that is achieved from tactile memories and the awareness of the surrounding through different senses. Thus, the study of senses between the sighted and the blind is essential in order to comprehend the methodology to construct an architectural space that the body can discover its resonance, and to enhance with rich experiences that can structure the most intimate touches with the body for both groups.

In this thesis, it is composed of three chapters: senses, wayfinding, and sensual projects. In the parts of senses and wayfinding, sighted and blind people are compared and examined in order to understand their needs

---

8 John M. Hull, Idem, xiii.
10 Idem.
and point of view in different aspects. In terms of applying the blind people’s perspective, I have applied extensive knowledge from a blind author, John M. Hull, who is not blind from birth. Thus, he fully understands the perspectives of both sighted and blind. Although Hull cannot be the only represented case of the blind people, but his interpretation of blindness is very valuable and direct. He collected his daily experiences and knowledge in the cassettes, and then recorded it in the diary. As he stated, “I kept the diary partly in order to monitor my own reactions to blindness, and thus to keep some sense of balance and control in what was a deeply disturbing period of my life, and partly in an attempt to communicate with sighted people.”

He spent three to four years to organize his diaries and researches, and then the book On Sight and Insight: a Journey into the World of Blindness has published in 1990. On the last page of Foreword, he has written a small passage to the blind reader:

> Blind people differ from each other as much as sighted people do. I do not claim to speak for you, but only for myself. You do not need to know what blindness is like, because you are blind. Perhaps you are reading this book in order to discover companionship with someone else who has passed your way. I hope you find it here.

Because of his intensive observant and awareness, I have gained a lot of insights into the world of blindness.

From the materials in this thesis that are consisted of sensual exploration, wayfinding understanding and sensual projects examination, one will gradually gain some knowledge in the sensory world. It is very interesting and inspiring to comprehend the imagination, methodology and requirement to create an architectural space that both sighted and blind can discover comfort and resonance. Along with the interactions between body, imagination and environment in the architectural experience, one will eventually gain some memories in every place he or she has visited. Thus, it will enhance the rich experience in the space, and structure the most intimate touches with the body for both groups.

---

11 John M. Hull, Idem, xi.
12 John M. Hull, Idem, xiv.
CHAPTER 1: SENSES

In this chapter, the five sensory systems such as vision, hearing, touch, scent and taste will be examined. After the understanding of the senses, the study of body, dimension and scale will be introduced. Throughout history, vision is always considered as the dominant sense, which is dated back to the invention of perspectival representation during Renaissance. However, the vision based ideology may lead to the growing experiences of alienation, detachment and solitude. Thus, studying vision between the sighted and blind is essential. It is interesting to explore the verbal implications between both groups, the need of shadows and darkness for vision to determine the depth and distance, and the importance of applying vision into the field of architecture.

The sense of hearing provides a three-dimensional atmosphere. In the richness of the oral world, experiences will be furthered enriched. Thus, the experience in the London underground, the meaning of bells, the problematic of noise, the different approaches of the privatized soundscape, and the development of sonic architecture will be extremely interesting.

The sense of touch is the unconscious of vision that also provides three-dimensional information of material bodies. It is the tool to provide information of texture, weight, density and temperature. For the blind people, touch can provide solid information comparing to sound, which is very abstract. For that reason, the study of tactile and information is important, along with the tactile perception of Braille. The film by Werner Herzog “Land of Silence and Darkness” will be mentioned, in order to understand the power of tactile sign language of the deaf-blind group.

Scent is essential to capture one’s memory of the place. The nose makes the eyes remember. For the blind people, the sense of smell can help awareness of one’s location. Odour can also relate to hunger and the desire to consume.

Our sensory experience originates in the sensation of the mouth. However, vision and tactile can attract the sensation of taste. But for the blind people who are without visual stimulation, the sense of taste will be strongly enriched. Sighted people, for instance, can also experience tasting in the dark to experience some adventures.

Architecture should introduce and express behaviour and movement, along with the proper architectural
scale so that the body will feel comfortable. In other words, the primitive tool of sensing the space is the body. Thus, the understanding of body, dimension and scale is essential, such as the studies of Vitruvius’ ideas, Leonardo da Vinci’s Vitruvius Man, Le Corbusier’s Le Modular, and Oskar Schlemmer’s “Triadisches Ballett”. On the other hand, for the blind people, the requirements for the body, dimension and scale are very different comparing to the sighted people. For example, the white cane itself will become an extension of the body. The movements of the surrounding will be fully experienced by the body, which can be seen in the situation as simple as travelling on a train. Furthermore, for a blind person, a house is an extension of the body. It is interesting to comprehend that one has to take every step seriously in order to formulate a spatial idea of the place. In terms of the exploration of wayfinding of the sighted and blind people, it will be introduced in Chapter two.
VISION

SIGHTED

In the Western culture, vision is considered as the dominant sense starting from the classical Greek ideology, which regarded the eyes are the more accurate tool than the ears especially in the philosophical aspect. In the philosophical essays, Modernity and the Hegemony of Vision has stated, “Beginning with the ancient Greeks, our Western culture has been dominated by an ocularcentric paradigm, a vision-generated, vision-centered interpretation of knowledge, truth, and reality.”

During the Renaissance, the five senses had been categorized into a hierarchical manner from vision to touch according to the cosmic body. “Vision was correlated to fire and light, hearing to air, smell to vapour, taste to water, and touch to earth.” The invention of perspectival representation enriched the idea of the self, which put vision as the center point of the perceptual world.

In our contemporary period, the vision based ideology not only remains the same, but more distinguishable, thus diminishes the other senses. This lead to the growth of alienation, detachment and solitude in our inhumanity approach of contemporary architecture and cities. As we consider ourselves as visionary beings, we have focused on vision and forgotten other senses that lead us into isolation, detachment and exteriority. “Modernist design has housed the intellect and the eye, but it has left the body and the other senses as well as our memories and dreams, homeless.” Architecture should reflect the flow of human experience and connect “in the metaphysical questions of the self and the world, interiority and exteriority, time and duration, live and death.”

The development of print, artificial illumination, photography and cinema have backboned the modern

13 Juhani Pallasmaa, Idem, 7.
14 Idem.
15 Idem.
16 Juhani Pallasmaa, Idem, 10.
17 Idem.
18 Juhani Pallasmaa, Idem, 8.
The increase of speed in the technology development directs vision into the world of flatten images. As David Harvey stated:

A rush of images from different spaces almost simultaneously, collapsing the world’s spaces into a series of images on a television screen... The image of places and spaces becomes as open to production and ephemeral use as any other commodity.20

The mass production of visual imagery creates the alienation of vision from “emotional involvement and identification, turning imagery into a mesmerising flow devoid of focus and participation.”21 Michel de Certeau mentioned the negativity of visual based culture:

From television to newspapers, from advertising to all sorts of mercantile epiphanies, our society is characterized by a cancerous growth of vision, measuring everything by its ability to show or be shown, and transmuting communication into a visual journey.22

BLIND

The misunderstanding between the sighted and blind in vision is verbal implication, such as the usage of the words ‘here’ and ‘there’, which the blind people will not have the ability to fully capture the direction without sight. As Hull stated, “the child may not realize the color implication of blindness. An adult might be surprised at the thought that a child would not realize that a blind person could not see colors, but then a blind person might be surprised that a sighted person did not realize the verbal implication of blindness.”23

As simply as the expressions like ‘nice to see you again’ and ‘I see what you mean’ can be problematic and unclear to the blind people. For example, if a blind person wants to say ‘nice to see you again’, he or she will rephrase to ‘I am pleased to meet you’. Therefore, the expression of ‘I see what you mean’ will be rephrased to ‘I understand you’. 24 Basically phrases with visual metaphors can be avoided with more explanations of that expression. In expressions that are depending on images that are taken from sight, blindness will lead to

19 Juhani Pallasmaa, Idem, 11.
21 Juhani Pallasmaa, Idem, 14.
22 Idem.
ignorance. In other words, a sighted person should aware of a blind person’s condition, which is without sight, in order to avoid unnecessary misunderstanding and embarrassment.

One may also wonder how the blind people distinguish shape without color. For the sighted people, color and shape are absolutely inseparable although they are easily distinguishable with vision. In other words, one believes that “there can be no shape without color and no color without shape.” However, it is not true to blind people. Shape and color can be separable, which blind people can fully experience different shapes without any colors. “It would be more accurate to say that shapes and textures are inseparable but distinguishable.” In terms for the shapeless elements like wind and water, a blind person will apply touch, such as the wet/dry, hot/cool and light/heavy sensations, in order to grasp an idea without texture.

Shadows
Shadows and darkness are essential for the sense of vision to determine the depth and distance. “In great spaces of architecture, there is a constant, deep breathing of shadow and light; shadow inhales, and illumination exhales, light.” Other then in architecture, shadows also play an important role in the other areas. For example, in Jun’ichiro Tanizaki’s *In Praise of Shadows*, he mentioned that Japanese cooking is inseparable from shadows:

And when yoken is served in a lacquer dish… it is as if the very darkness of the room were melting on your tongue… In olden times the blackened teeth of the geisha and her green-black lips, as well as her white painted face, where intended to emphasise the darkness and shadows of the room.
Vision and Architecture
In the past, architecture was originally connected with the body movement and behaviour, instead of focusing on the physical and conceptual appearance. “Construction in traditional cultures is guided by the body in the same way that a bird shapes its nest by movements of its body.” 29 For example, the construction method of using clay and mud tend to be less visual orientated. Greek architecture can be an interesting matter. Although the Greek had invented the system of the optical corrections, they did not abandon the privilege of using other senses. “The sense of sight may incorporate, and even reinforce, other sense modalities; the unconscious tactile ingredient in vision is particularly important.”30

Vision has gradually gained its importance in architecture especially in the Modernist’s ideology as Le Corbusier has stated,

I exist in life only on the condition that I see, I am and I remain an impenitent visual – everything is in the visual. One needs to see clearly in order to understand… I urge you to open your eyes. Do you open your eyes? Are you trained to open your eyes? Do you know how to open your eyes? Man looks at the creation of architecture with his eyes, which are 5 feet 6 inches from the ground… Architecture is a plastic thing. I mean by ‘plastic’ what is seen and measured by the eyes.31

In other words, Le Corbusier defined the architecture of the eye along with his famous statement: “Architecture is the masterly, correct and magnificent play of masses brought together in light.”32 However, he did not discard the other senses with the focus on materiality and gravity, which “prevented his architecture from turning into sensory reductivism.”33

In the scale of city planning, vision is the dominant tool for the determination and construction. For example, the idealised town plans of the Renaissance and the optical perfection in the Functionalist ideology. In the contemporary city planning, the vision based principle became even more important then the past. “The contemporary city is more and more ‘the city of the eye’, detached from the body by rapid motorised movement or through the overall aerial grasp from an aeroplane. The processes of planning have favoured the idealising Cartesian eye of control and detachment.”34

29 Juhani Pallasmaa, Idem, 16.
30 Idem.
31 Juhani Pallasmaa, Idem, 17.
32 Juhani Pallasmaa, Idem, 18.
33 Idem.
34 Idem.
seeing zone

sighted

blind

peripheral vision
cone of vision
visual acuity

60°  30°
HEARING

SIGHTED

The role of senses has reflected an important aspect in our cultural behaviour and communication. As Edward T. Hall has mentioned in his book *The Hidden Dimension*, “personal space offer important insights into instinctual and unconscious aspects of man’s relation to space as the basis for the design of intimate, bioculturally functional space.”\(^{35}\)

Throughout history, sight was not originally played as the dominant sense. For example, in Lucien Febvre’s belief, “the 16th century did not see first: it heard and smelled, it sniffed the air and caught sounds, It was only later that it seriously and actively became engaged in geometry, focusing attention on the world of forms…”\(^{36}\) However, the hierarchy of the senses changed in the 20th century, which vision began to dominate the other senses, and led to the “increasing separation of the self from the world.”\(^{37}\)

The sense of hearing can enrich the spatial experience and the understanding of space. From the reverberation, one can hear the size of the space. One will also experience a continuous event when he or she awares of the oral world.

Sight isolates, whereas sound incorporates; vision is directional, sound is omni-directional. The sense of sight implies exteriority, whereas sound creates an experience of interiority. I regard an object, but sound approaches me; the eye reaches, but the ear receives.\(^{38}\)

The significance of hearing may not be obvious, but it provides a three dimensional atmosphere. For example, in the silent film, in order to compensate for the lack of plasticity without sound, the actors had to over-acting. Furthermore, in the scale of a city, hearing can perceive the sound of daily lives.

Anyone who has half-woken to the sound of an ambulance in a nocturnal city, and through their sleep experienced the space of the city with its countless inhabitants scattered within its structures, knows the power of sound to the imagination; the nocturnal sound is a reminder of human mortality, and it makes

\(^{35}\) Idem.
\(^{36}\) Juhani Pallasmaa, Idem, 15.
\(^{37}\) Idem.
\(^{38}\) Juhani Pallasmaa, Idem, 34.
Reverberation in the dark will create a remarkable and mysterious atmosphere, and “can attest to the extraordinary capacity of the ear to carve a volume into the void of darkness. The space traced by the ear in the darkness becomes a cavity sculpted directly in the interior of the mind.”

BLIND

In the world of blindness, everything is related to action. Thus, every sound is the cause of activity. Once nothing is happening, then there is silence. The perceived world is stable comparing to the acoustic world. “The seen world cannot escape from your eyes. Even in darkness, you can use a torch and force things into visibility.” In other words, one can simply close the eyes and exclude the visual elements, but he or she can never control the acoustic world. As Hull stated:

It stays the same whichever way I turn my head. This is not true of the perceptible world. It changes as I turn my head. New things come into view. The view looking that way is quite different from the view looking this way. It is not like that with sound. New noises do not come to my attention as I turn my head around…

The acoustic world is independent from one’s movement. It is unpredictable and surprising at the same time. No one can shut out from it. The only thing that the blind can manage is to distinguish and aware of different sounds in order to judge distance and orientation. With the help of binaural hearing technique, it helps both the blind and sighted people to distinguish and locate the sound source. Two-ear hearing is similar to two eye vision, which we are able to perceive depth in space. The ears’ ability to perceive the direction of sound is due to three reasons. First, it is the different of sound levels. Second, it is the length of different sound sources that come towards the two ears, which cause acoustical shadow. Third, it is the different arrival time of the sonic sources towards the two ears that define the direction of sound. For example, when the sounds are coming in front of one’s face, there will not be any differences of the arrival time. Thus, the ears cannot perceive the direction of the sound sources. However, when the sounds are coming sideways towards the

---

39 Idem.
40 Juhani Pallasmaa, Idem, 34-35.
41 John M. Hull, Idem, 73.
42 Idem.
binaural hearing zone

- helps us to locate a sound source
- able to determine the angle that the direction of sound
- 2-ear hearing is similar to 2-eye vision, which we are able to perceive depth in space

The ears’ ability to perceive the direction of sound is due to:

1. different sound levels

2. different source-ear path length for the 2 ears, causing acoustical shadow

3. different arrival times of sound at the 2 ears

horizontal plane
- with accuracy of 1 or 2 degrees

vertical plane
- no difference between the arrival times
- the ear can’t discriminate between the direction of sound
ears, then it will be possible to detect the direction of sounds due to a bigger difference of the arrival time.

Tactile sound is an interesting field. It is the sensual sound that is transmitted to the human body through contact instead of obtaining the sound waves through hearing. “Explosions, crashes, sonic booms, and thunder are all normally felt in addition to being heard.”

For example, one will feel the vibration of the platform when a train passes by. Thus, tactile sound can be very useful for the blind people, who can enjoy a full body experience of the vibration. Aside from ground motion, tactile sound can also be transmitted through water. It is also widely used in the field of entertainment, such as cinema, dance floors, water beds and so on. It can be used to enhance the sense of realism. Combining with the use of subwoofer, low frequencies can be both felt and heard.

Thus, blind people can have the relaxing experience through vibrations as well as hearing.

London Underground
Travelling in the London Underground is an outstanding and sensual experience to Hull. As the train arrives and leaves, the air current changes and brings along the scent of newspaper, oils, smoke, food, garbage and so on. Although he cannot enjoy the view, he can “easily distinguish the metallic click of the wheels on the rails, the electronic hum of the engines as the train gathered power, the swish of the automatic doors opening and closing, and the rushing noise of the air in the tunnel itself.”

Human noises along with the background noises of the station enter the compartment each time the doors are opened. The movement also changes in a repetitive manner when people are entering and leaving the train. These experiences are extremely rich to a blind person, who lost the sight, but at the same time he or she has gained the consciousness of experiencing different surroundings.

---

44 Idem.
45 John M. Hull, Idem, 117.
Bells
The sound of the bells can be very distinguishable and meaningful to the blind people. In the example of Hull’s experience, his head seemed to be ringing along with the bells. He could feel the vibrations in the air and the trembling from the floor. The following is his description of the experience:

I tried to count how many different patterns they were ringing, and, without success, to work out how many bells must be in the tower. I thought that I really must become more expert in this lovely thing. I tried to describe the qualities of the sound to myself, mentally comparing it with other bells I had recently heard. Again and again, the descending peals chimed out, over the babble of conversation, cutting up the cool autumnal air, weighting everything with a strange, solemn expectancy. I was flooded with joy, and repeated again and again in my heart, ‘Yes, I hear you, dear bells, I hear you.’

On the other hand, sighted people may not aware the unique experience of the sound of bells, at least not as powerful as the blind people. It is because he or she may easily focus and overwhelm on the continuous visual experiences.

Bell ringing is not simply just a sound. It was the most distinguishing sound in the 19th-century French village. The bell tower did not only represent as an auditory space, but also a mark of territoriality. “The territory circumscribed by the sound of a bell obeyed the classical code of the beautiful – the schema of cradle, nest, and cell. It was an enclosed space structured by the sound emanating from its centre.”

The bell tower usually located in the center of the village, thus the houses that were surrounded the tower could situate within walking distances. The reason was once the public announcements started, the inhabitants could easily reach it. “The crucial functions of the bell tower were to raise the alarm and ensure the preservation of the community. A sort of correlation was established between bell and boundary, and between bell ringing and processions. Both served to define a space with readily perceptible limits.”

The loudness of the bell was also crucial if it could reach to the outskirt of the territory, in order to ensure that all public announcements, alerts and commands could be heard from the inhabitants. “Bell ringing defined a space within which only fragmented, discontinuous noises were heard, none of which could really vie with the bell tower.”

The sound of bells formed strong cultural atmosphere and anchored the sense of localism. “Owing to the regular-

---

48 Idem
ity with which they were rung, bells played a part in the periodic sacral recharging of the surrounding space.”

Thus, the church usually located in the center of the village.

During the Catholic Reformation, the Church began to heirarchize bell ringing. “A cathedral was supposed to have between five and seven bells while a collegiate church might have three, and a parish church two, or at the most three.” The sound of the monastery bells should not be louder than a parish church. In other words, the sound of the bells represented the hierarchy of the churches. “The Council of Toulouse (1590) prohibited the ringing of bells in any church before those of the Cathedral or of the mother church had given the signal.” This regulation was given during the Middle Ages. When a new church was founded, only one bell was permitted in order to represent its status.

Bell ringing was also served as a tool of orientation for the inhabitants. It offered the sense of protection in the areas such as mountains, coastal areas, hilly regions, forests and flat areas. The season could also affect the time of bell ringing for orientating purposes. For example, in Sainte-Inferieure, a wooded, hilly community, they rang the bells at ten during the summer evenings, and adjusted the time to nine at night during the winter. Bell ringing was also used along the coastal areas when there was no light house. Whenever the fog arrived, the bell ringing was used to guide the sailors.

As a result, bells served many purposes in the 19th-century villages. It was used as a mark of territoriality and protection, representation of hierarchy, and the tool of orientation. “Alone it justified the deep attach-

ment to bells until the symbolic tie between ringing and communities began to unravel.”

---

50 Idem
51 Idem
52 Michael Bull and Les Back, Idem, 120.
54 Idem
Noise

Blind people are very sensitive to noise. They will get stressful and depression after a long day of traveling or working. In Hull’s case, he got a lot of tension and psychological exhaustion after being with his family for one afternoon. The following is his description of the stressful day due to the problem of noise:

It certainly was rather a noisy day. Two older children were having a disco upstairs. Two younger boys were enjoying an exciting game of ‘He-man’ in my study. The radio was on downstairs, and a group of younger children were racing around everywhere. The whole house was gradually strewn with toys, despite the best efforts of hard-pressed adults to tidy up, so that in the end I could hardly take a step unless I cleared the ground in front of me, like some scared ritual. All that makes me feel bombarded; I cannot respond even though the environment is calling out to me. This gives a sense of remoteness.\(^5^5\)

Blind people have lost vision, thus eventually gained a strong hearing. They cannot control noise, which is unlike vision, who can simply close the eyes and shut out from the annoyance. For that reason, blind people can only calm down themselves and attempt to choose the type of sounds that are comfortable for them. Otherwise, sleep may be helpful to release all the physiological exhaustion that may lead to depression.

Furthermore, it is quite interesting to examine the problem of noise in the world of vision. It began in the early 20th-century mechanical era of the sound of technology. Because of the new types of mechanical noises, people started to have noise abatement, which is a very different approach to handle noise from the blind people. From the analysis of that problem, one will comprehend the cultural meaning of sound and its relation to the technology-related development in the early 20th-century city life.\(^5^6\) Sound of machines and motorized traffic took over the urban soundscape. In 1908, the German cultural philosopher and physician Theodor Lessing mentioned about the new changes in his paper Der Larm. “Lessing declared himself to be annoyed by both traditional noise, such as the din of church bells and carpet beating, and the more recent nuisance of rattling machines, shrilling gramophones, ringing telephones, and roaring automobiles, auto buses, trams and trains.”\(^5^7\) He believed that noise represented anti-intellectual.

Noise, he asserted, raised and exaggerated deeply rooted human instincts and emotions – the ‘subjective’ functions of man’s soul – and narrowed and dimmed the intellectual and rational – ‘objective’ – functions of the soul. Noise was the most primitive and most widely applied means to deafen consciousness. In fact, noise was the ‘vengeance’ of the labourer working with his hands against the brainworker who laid down...

\(^5^5\) John M. Hull, Idem, 141.
\(^5^6\) Michael Bull and Les Back, Idem, 165.
\(^5^7\) Michael Bull and Les Back, Idem, 167.
Lessing argued that silence was essential to the creation of culture. However, mechanical noises were part of the side effects of the era, which were exceptionally loud. Noises were always part of the urbanization. The Buddhist scriptures dated from 500 BCE mentioned “the ten noises in a great city”, which were “elephants, horses, chariots, drums, tabors, lutes, song, cymbals, gongs, and people crying ‘Eat ye, and drink!’” 59 William Hogarth wrote in the article The Enraged Musician in 1741 that was well captured the noise of an 18th-century city street in London. (See Fig. 1) “The acoustical distress experienced by his ‘Enraged Musician’ was suffered by countless other urban inhabitants as cities’ populations increased more rapidly than their geographies expanded.”60 In other words, as the population increased, the amount of noises would boost as well, which led to the higher frequency of complaint. Therefore, people began to question of the definition of noise and its cultural meaning of sound.

---

58 Idem
60 Emily Thompson, Idem, 116.
Organic sounds were considered as a creation by humans and animals while working or playing, which had always accompanied human civilization. Later on with the development of urbanization, people began to concentrate in an area. Because of industrialization, new kinds of noises began to develop. For instance, the sound of the railroad and its steam whistle became a new complaint not only because of its loudness, but due to its unfamiliarity. "Over the course of the 19th century, the clanking din of the factory, the squeal of the streetcar, and other new sounds were increasingly incorporated into the soundscape." In 1896, Dr. J. H. Girdner listed out the traditional noises in “The Plague of City Noises”, which were “horse-drawn vehicles, peddlers, musicians, animals, and bells.” Nevertheless, only shortly within thirty years, the city soundscape was not only accompanied by traditional noises.

The air belongs to the steady burr of the motor, to the regular clank clank of the elevated, and to the chitter of the steel drill. Underneath is the rhythmic roll over clattering ties of the subway; above, the drone of the airplane. The recurrent explosions of the internal combustion engine and the rhythmic jar of bodies in rapid motion determine the tempo of the sound world in which we have to live.

The dramatic sonic transformation in New York was an excellent example to demonstrate the challenge of noise that the inhabitants had to handle. The soundscape in 1930 was totally different than in 1900. "The challenge was stimulated not simply by the noise itself, but also by social and cultural forces at work in urban America." The image “City Noise” from the 1930 report of the Noise Abatement Commission of New York City clearly showed the overwhelming of the new soundscape with mechanical technologies. (See Fig. 2) The noise reform was a program to improve overcrowded areas, avoid outbreak disease, and eliminate industrial pollution. During the 1920s, scientists had the ability to measure noise with electroacoustical instruments. Along with the invention of this tool, it had raised the expectation to solve the noise disturbances. However, it was impossible to simply just change the public soundscape. Thus, people started to fix the problem by adding acoustical application in the interior.

By the end of the decade, urban dwellers were forced to retreat into private solutions to the problem of noise. Acoustical expertise was brought back indoors, and acousticians devoted themselves to the construction of soundproof buildings that offered refuge from the noise without.

61 Emily Thompson, Idem, 117.
62 Idem
63 Idem
64 Idem
65 Idem
66 Emily Thompson, Idem, 119.
67 Idem
One may wonder why noise became a particular and crucial problem in the early 20th-century even though noise was always a product from human activity. The reason was that “the physical transformation of the soundscape, as well as the social and cultural transformations taking place within it, combined to create a culture in which noise became a defining element.”  

In the *Saturday Review of Literature*, it stated:

> There is nothing fanciful in the assertion that the pitch of modern life is raised by the rhythmic noise that constantly beats upon us. No one strolls in city streets there is no repose in automobiles or subways, nor relaxation anywhere within the range of a throbbing that is swifter than nature. Our nervous hearts react from noise to more noise, speeding in the car, hastening the rattling train, crowding in cities that rise higher into an air that, far above the grosser accidents of sound, pulses with pure rhythm.  

From the study of noise, one could comprehend the cultural aspects that produced it. For instance, back to the example of a steam whistle. The sound of it did not only represent the arrival of both railroad and factory, it was an acoustical representation of industrialization. Because of the production progress of the industrialization, the amount of noise constantly increased. However, people only concerned about materialized benefit. Thus, “noise was a part of the necessary industrial processes and that the industry was a very necessary part of the community and therefore the noise had to be tolerated as a necessary evil.”  

In other words, noise symbolized the great achievement of the 20th-century industrialization era. “Civilization, the greatest of all achievements, is by that token, of all, the most audible. It is, in fact, the Big Noise.”  

Laws had been passed to enforce noise abatement in the city. In 1908, General Order 47 had been passed in New York to against particular kinds of noises, which included “the shouts and bells of street vendors, the cries of newsboys, whistles on peanut roasters’ carts, and the assorted sounds of rollers skaters, kickers of tin cans, automobile horns, automobiles operated without mufflers, and flat-wheeled streetcars.”  

In 1909, the regulation became more specific:

> No peddler, vender, or huckster who plies a trade or calling of whatsoever nature on the streets and thoroughfares of the City of New York shall blow or use, or suffer or permit to be blown upon or used, any

---

68 Idem  
69 Emily Thompson, Idem, 119-120.  
70 Emily Thompson, Idem, 120.  
71 Idem  
72 Idem  
73 Emily Thompson, Idem, 124.
horn or other instrument, nor make, or suffer or permit to be made, any improper noise tending to disturb
the peace and quiet of a neighbourhood for the purpose of directing attention to his ware, trade or calling,
under penalty of not more than $5 for each offence.\(^\text{74}\)

Noise zoning was another methodology of noise abatement in the city. Zoning was used to organize the
location of different activities. Thus, with clear organization of different urban sectors such as residential,
commercial and industrial, city planners could improve the social performance in the city. Along with the
regulation of quiet zones around New York’s hospitals, “legally defining spaces in which a range of noises
would be rendered illegal as a result of their proximity to the ill.”\(^\text{75}\) Schools also suffered from the noisy sites
like garages, factories and traffic on the roads. By 1914, quiet zones had been established in many American
cities for the hospitals and school. Anti-Noise Policeman had also formed to enforce the regulation of noise
abatement.\(^\text{76}\) The application of the zoning laws apparently was a good solution to noise abatement in the
city. However, it did not solve the problem of noise within residential districts. It was only aimed for “larger
social benefits of a city free of unnecessary noises.”\(^\text{77}\) In terms of individual’s problem of noises, one had to
solve it into his or her own account.

The sound of technology was full of cultural symbolism of the 20th- century mechanical era. Different types
of technical sounds were constantly amplified that led to public noise abatement activities. The symbolisms
of loud sounds “have been attributed with characteristics such as power, strength, progress, prosperity, en-
ergy, dynamics, masculinity and control.”\(^\text{78}\) However, once they considered as unwanted, then they were la-
belled as noise. “Noise could threaten the pastoral idyll of the 19th- century American literary men; society’s
intellectual strength, cultural maturity and cultivated self-control.”\(^\text{79}\) In other words, “noise meant chaos,
silence meant order, and rhythm meant control within and over societal life.”\(^\text{80}\) Through the public awareness
of noise abatement and the quiet zoning regulation, it became possible to reform a new urban rhythm.

\(^{74}\) Emily Thompson, Idem, 125.
\(^{75}\) Emily Thompson, Idem, 126.
\(^{76}\) Idem
\(^{77}\) Emily Thompson, Idem, 127.
\(^{78}\) Michael Bull and Les Back, Idem, 182.
\(^{79}\) Idem
Privatized Soundscape

For the blind people, their privatized soundscapes can be consisted of natural elements like rain, wind and thunder, instead of depending on mechanical inventions like the sighted group. The experience of the falling rain can become a continuity of acoustic experience. Hull has written a rich and sensual description of the falling rain:

I hear the rain pattering on the roof above me, dripping down the walls to my left and right, splashing from the drainpipe at ground level on my left, while further over to the left there is a lighter patch as the rain falls almost inaudibly upon a large leafy shrub. On the right, it is drumming, with a deeper, steadier sound upon the lawn. I can even make out the contours of the lawn, which rises to the right in a little hill. The sound of the rain is different and shapes out the curvature for me. Still further to the right, I hear the rain sounding upon the fence which divides our property from the next door. In front, the contours of the path and the steps are marked out, right down to the garden gate. Here the rain is striking the concrete, here it is splashing into the shallow pools which have already formed. Here and there is a light cascade as it drips from step to step. The sound on the path is quite different from the sound of the rain drumming into the lawn on the right, and this is different again from the blanketed, heavy, sodden feel of the large bush on the left. Further out, the sounds are less detailed. I can hear the rain falling on the road, and the swish of the cars that pass up and down...  

His experience was enriched with echoes and the sound of different textures in the scene. For him, it is equivalent of having light on the landscape where he could sense every detail with his sonic touches on the beautiful surface. He said, “If only rain could fall inside a room, it would help me to understand where things are in that room, to give a sense of being in the room, instead of just sitting on a chair.” This unique experience gave him a sense of richness, sophistication and harmony.

Wind and thunder can also provide another type of sensual experience. When the wind blows, it gives life to all the sounds in the environment. As Hull explained, “The leaves are rustling, bits of paper are blowing along the pavement, the walls and corners of the large buildings stand out under the impact of the wind, which I feel in my hair and on my face, in my clothes.” In terms of the experience of thundering, it is more exciting than wind. It gives the sense of space and distance. In his description of such an experience, he stated, “Thunder puts a roof over my head, a very high, vaulted ceiling of rumbling sound. I realize that I am in a big place, whereas before there was nothing there at all. The sighted person always has a roof overhead,

---

81 John M. Hull, Idem, 26-27.
82 John M. Hull, Idem, 27.
83 John M. Hull, Idem, 12.
in the form of the blue sky or the clouds, or the stars at night. The same is true for the blind person of the sound of wind in the trees. It creates trees; one is surrounded by trees whereas before there was nothing.”  

For the sighted, weather with rain, wind and thunder is considered as bad weather. For the blind, it is the moment to experience a rich and sensual occurrence, where one can sense every object in the scene, and create his or her privatized soundscape.

Privatized soundscape for the sighted people is very different from the blind people. The group of sighted tend to avoid the sound of nature and create different industrialized audible inventions such as Walkman, radio sounds, and recorded music. The invention of Walkman has created a new mobile listening experience for the sighted people. As the listener walks in the city, he or she will transform the city into a personalized atmosphere. “We see him fully absorbed, lost in his sonic universe, whereas just one more step, a scream, or a glance is all it takes to bring him back into contact with his surroundings.” Mobile listening device allows people to enjoy music outside of a theatre, which has fully introduced derealization of urban space. “The Walkman develops the separation between an original sound and its electro-acoustic reproduction.”

Walkman is an invention that influenced the connections between the ear, the step and the environment. The location of the threshold of public and private becomes more essential. For instance, “it is paradoxical that access to public space is associated with the beginning of private listening whereas entering the private realm is associated with openness towards the surroundings.” Once the Walkman has turned on, the person will start to listen and begin the sonic journey, which outlines the moment when one enters the public space.

The invention of Walkman in the late 20th century gives the listeners the opportunity to experience a diversity of perspectives and experiences on the street. One begins to have a chance to listen not only the sonic environment that is based on his or her position; the mobile sonic device can mask the public soundscape and personalize one’s experience.

In the early 1960s, mobile radio began to install into most automobiles. During the 1970s, they became the requirement in most cars along with the development of portable tape decks.

---

84 Idem.
Tape decks made music consumers mobile, indeed automobile… Thus the American mass market was opened up by the car playback system. The mediated sound of the radio and later the cassette deck produce their own specific aural relational qualities. 88

One of the benefits of having the sound of radio or cassette in the automobile is to provide some mediation to the driver; second, is to gain individualism and ownership. “From the move away from travelling collectively in trains at the beginning of the twentieth century, to the discomfort of inhabiting restricted spaces with strangers to the desire for smooth, unbroken journeys unfettered by timetables; these concerns have become embodied in everyday attitudes towards automobile use.” 89 Thus, along with the aural privacy in the automobile, it can provide the mask of sonic aggression on the road, and enhance a smooth, enjoyable journey.

The car is one of the most powerful listening environments today, as one of the few places where you can listen to whatever you like, as loud as you like, without being concerned about disturbing others, and even singing along at the top of your voice – the car is the most ubiquitous concert hall and the ‘bathroom’ of our time. 90

As the comfort level increased in the automobile, the feeling of being at home will develop especially when one can gain the sense of secure.

I want to suggest that the nature of this ‘dwellingness’ has changed from ‘dwelling on the road’ to ‘dwelling in the car’ … car drivers control the social mix in their car just like homeowner control those visiting their home. The car has become a ‘home from home’, a place to perform business, romance, family, friendship, crime and so on… The car driver is surrounded by control systems that allow a simulation of the domestic environment, a home from home moving flexibly and riskily through strange environments. 91

Drivers tend to consider the sound of the engine as discomfort, and thus turn on the music to cover up the sonic aggression. Accordingly, the sound of the radio or recorded music can give the driver a sense of protection. “Music, as such, becomes a substitute for community, warmth and social contact. In this isolated world of the listener a need arises to substitute or replace one’s sense of insecurity with the products of the culture industry, leading to new forms of dependency.” 92 Therefore, with the accompanied soundscape, one will

---

89 Michael Bull and Les Back, Idem, 358.
90 O. Stockfeld, Essays on Vroom and Moo (Tampere: Tampere University, 1994) 359.
enjoy the privatized aural space of the automobile. It is the moment that one can choose to reflect, concentrate on the music, or relax and do nothing.

It’s a totally different environment. I like driving, I love driving on the road and you like driving on your own because it’s a totally separate environment. It’s a total indulgence, it’s your environment. You control it. You can do whatever you like in it. It’s like time off. You’re travelling from A to B, but it’s the ultimate idleness, really. You’re not really doing anything but listening. It’s great… So when there’s someone else in the car with you, you don’t have so much control over the environment. You can’t let go so much.93

The industrialized audible inventions such as Walkman, mobile radio, and recorded music have greatly influenced one’s choice to privatize the soundscape. During the late 20th-century, music was no longer only available as a public experience. It became transferable into personal spaces such as home and automobile. “Sound recording, then, gave a powerful boost to the ‘privatization’ of experience, which may have held to be a fundamental aspect of twentieth-century culture.”94

After 1900, the nature of sound and the culture of listening had faced the dramatic transformation. “More troubling than the level of noise was its nature, traditional auditory irritants was increasingly drowned out by the din of modern technology.”95 However, it is culture constructed that the noisy soundscape had penetrated the atmosphere of living. Thus, along with the noise abatement, personal behaviour has also required to be improved in order to lower the level of noise in the city. Later on, with the development of the independent mobile abators, the relationship of sound and space had been reformed. “As the new soundscape took shape, sound was gradually dissociated from space until the relationship ceased to exit.”96 In other words, the traditional relationships between sound, space and time have been totally transformed.

95 Emily Thompson, Idem, 6.
96 Emily Thompson, Idem, 3.
Sound and Architecture
Sound has always been a neglected subject in our visual-dominant society, which has also played an important role in our daily lives. There are always areas of interrelation and disconnection between vision and audition. Thus, one may question on what is sound.

Sound is essentially non-spatial in character, or rather sound engulfs the spatial, thus making the relation between subject and object problematic. Sound inhabits the subject just as the subject might be said to inhabit sound, whereas vision, in contrast to sound, represents distance, the singular, the objectifying. Therefore aural relational experience might well differ from a more visually orientated one.\(^{97}\)

The history of aural culture is full of dramatic transformations. It is the transformation that affects the behaviour of one’s listening and what type of sound they are dictated to listen. All kinds of soundscape in different eras are cultural constructed that diffused into people’s living atmosphere. In other words, the soundscape has interconnection with the civilization that is constantly under construction.

Vitruvius (c.25 BC) was the first architect to analysis the acoustical aspects in relation to architecture in history. In the *Ten Books of Architecture*, Chapter Five of Book Five, he proposed the idea of using bronze sounding vessels, which must be proportional to the size of the theatre in order to transmit the sound in a consistent manner.

Then having constructed niches in between the seats of the theatre, let the vessels be arranged in them, in accordance with musical laws, in such a way that they nowhere touch the wall, but have a clear space all around them and room over their tops. They should be set upside down, and be supported on the side facing the stage by wedges not less than half a foot high. Opposite each niche, apertures should be left in the surface of the seat next below... \(^{98}\)

He also believed that materialization of the theatre is very essential to maintain the quality of sound. Wood is the finest option for resonant comparing to masonry, stone and marble. In Chapter Eight of Book Five, Vitruvius studied the acoustical aspects to locate the most suitable place for a theatre. He listed out four acoustical characteristics in a space that would influence the nature of sound: dissonant, circumsonant, resonant and consonant.

The dissonant are those places in which the first sound uttered that is carried up high, strikes against solid bodies above, and, being driven back, checks as it sinks to the bottom the rise of the succeeding sound. The circumsonant are those in which the voice spreads all around, and then is forced into the middle, where it dissolves, the case-endings are not heard, and it dies away there in sounds of indistinct meaning. The resonant are those in which it comes into contact with some solid substance and recoils, thus producing an echo, and making the terminations of cases sound double. The consonant are those in which it is supported from below, increases as it goes up, and reaches the ears in words which are distinct and clear in tone.99

From the detailed studies of the acoustics, it would be easier to comprehend how to design a vibrant theatre. Thus, Vitruvius had made a pioneer progress on a more comprehensively study of the acoustical field, where Aristotle (384-322 BC) could only refer to the basic phenomena of echoes and the wave concept.

---

99 Peter Lord and Duncan Templeton, Idem, 4.
TOUCH

SIGHTED

The 18th century Irish philosopher and clergyman, George Berkeley, had related vision with touch. He believed that it is impossible to apply only vision to comprehend materiality, distance and depth without the sense of touch. “Vision needs the help of touch, which provides sensations of solidity, resistance, and protrusion; sight detached from touch could not have any idea of distance, outness, nor profundity, or consequently of space or body.”\textsuperscript{100} In other words, the sense of touch is the unconscious of vision that provides three-dimensional information of material bodies. “The sense of sight is built upon touch, and is a development of touch, considered from the development point of view.”\textsuperscript{101} In other words, the difference between sight and touch is that “visual space is presented at the same time, while tactile space is presented bit by bit.”\textsuperscript{102}

The sense of touch is the tool to provide information of texture, weight, density and temperature. One can attempt to become a sculptor, who can master touch as powerful as vision. “The hands of the sculptor are independent organisms of recognition and thought; the hands are the sculptor’s eyes.”\textsuperscript{103} Touch can also reveal the history and the origin of the matter. “A pebble polished by waves is pleasurable to the hand, not only because of its shape, but because it expresses the slow process of its formation; a perfect pebble on the palm materialises duration; it is time turned into shape.”\textsuperscript{104} The skin can detect the temperature, and the foot can measure the gravity with the density and texture of the ground. “Standing barefoot on a smooth glacial rock by the sea at sunset, sensing the warmth of the sun-heated stone through one’s soles is extraordinarily healing; making one part of the eternal cycle of nature. One can sense the slow breathing of the earth.”\textsuperscript{105} Fireplace can also create the sense of warmth and intimacy. “It is like an immaterial alcove, a warm cave carved into the room itself, a zone of hot weather with floating boundaries.”\textsuperscript{106}

\textsuperscript{100} Idem.
\textsuperscript{101} John M. Hull, Idem, 183.
\textsuperscript{102} Idem.
\textsuperscript{103} Juhani Pallasmaa, Idem, 40.
\textsuperscript{104} Idem.
\textsuperscript{105} Juhani Pallasmaa, Idem, 40-41.
\textsuperscript{106} Juhani Pallasmaa, Idem, 41.
The sense of touch for the blind people can provide solid information comparing to sound, which is very abstract. However, it is different for a sighted person to experience the sense of touch. It is because all tactile impressions are secondary to visual impressions for a sighted person. Sometimes it is quite difficult to explain what is felt into verbal description. However, Hull has described a detailed experience in a cathedral church with the sense of touch:

In a cathedral, I have very little sense of the architecture as a whole. The windows, the tracery of the ceilings, the general proportion of the pillars, all this is lost. Only let me have a few minutes exploring with my fingers some of the intricate carvings on the screen, or to run the palms of my hands over the roughness of the stone, noticing the different textures and temperatures and something very vivid is regained. I must not be content merely to walk on the floors, but must stoop down and explore the tiles, or the rows of stone steps with my fingers. It is this which gives me a sense of real knowledge. 107

Fingers are an important tool to obtain real knowledge. However, what will happen to a blind person if both hands are full? The trick is to walk backwards and touch the walls with his or her body in order to find the way out. Thus, blind people usually avoid getting both of their hands full. One free hand is always helpful to ‘see’ with that hand. As Hull mentioned, “I do not experience not knowing where to go or where I am so long as I can guide myself with my free hand. I do not feel blind then…” 108 In other words, blind people ‘see’ with their fingers due to the reason once sight is gone, the sense of touch will be essential.

---

108 John M. Hull, Idem, 98.
Tactile and Materialization

SIGHTED

Descartes equalized vision with touch, he believed that the sense of touch to be “more certain and less vulnerable to error than vision.”\textsuperscript{109} However, when architecture lost the tactility and the scale of the human body, it will become “repulsively flat, sharp-edged, immaterial and unreal.”\textsuperscript{110} For that reason, one of the explanations that cause alienation in the contemporary architecture is the use of reflective glass. “The contradictory opaque transparency of these buildings reflects the gaze back unaffected and unmoved; we are unable to see or imagine life behind these walls. The mirror that returns our gaze is an enigmatic and frightening device.”\textsuperscript{111} On the other hand, the usage of natural materials, such as stone, brick and wood can enrich the sense of belonging and express their age and history.

Every city has its particular sound, which depends on the streets design and materialization. However the contemporary city has lost its sound due to numerous open spaces and the usage of artificial sound inventions. “The wide, open spaces of contemporary city streets do not return sound, and in the interiors of today’s buildings echoes are absorbed and censored. The programmed recorded music shopping malls and public spaces eliminate the possibility of grasping the acoustic volume of space.”\textsuperscript{112}

BLIND

Different textures and materials will enrich the experience of obtaining information from an object. Weight, texture, shape and temperature will provide pleasure for the touch. The action of holding and reholding of an object will allow a blind person to engage a rich exploration. In Hull’s experience of touching a South American water jar made form earthenware, he has described, “There was a lovely, scraping sound when one rotated the lid of the jar, and thousands of tiny, tinkling, hollow echoes were made when the full, round

\textsuperscript{109} Juhani Pallasmaa, Idem, 10.  
\textsuperscript{110} Juhani Pallasmaa, Idem, 20.  
\textsuperscript{111} Juhani Pallasmaa, Idem, 21.  
\textsuperscript{112} Juhani Pallasmaa, Idem, 36.
belling of the jar was touched with the fingernails." The sense of touch can also be applied on textures of the ground. Thus one can use the white cane to detect different materials. The frontal distance from the white cane to the feet is approximately 1.5 meters. The length of swinging the white cane sideways is around one meter. Comparing to the tactile zone of a sighted person, one can reach up to 1.7 meters in length when both hands are opened. The sense of touch is not only to obtain real knowledge, but also to gain pleasure to experience different textures and materials of every object. One will eventually gain and store with numerous tactile memories full of every inch of the surroundings and objects.

113 John M. Hull, Idem, 153.
Braille
Braille is a tactile communication skill for the blind people to read and write. This system is developed by a blind Frenchman, Louis Braille. Each cell consists of six dots within a rectangle that contains two columns with three dots each. This uncomplicated system can create the maximum of sixty-four compositions. (See Fig. 3) “The lines of horizontal Braille text are separated by a space, much like visible printed text, so that the dots of one line can be differentiated from the Braille text above and below. Punctuation is represented by its own unique set of characters.”\textsuperscript{114}

The Braille system was originally developed by a communication method created by Charles Barbier, which was designed for Napoleon’s codes for the soldiers without the need of applying light at night. Thus, it was also called night writing. Because of its complexity, it was soon rejected by the military. In 1821, Barbier met Louis Braille in the National Institute for the Blind in Paris, France. “Braille identified the major failing of the code, which was that the human finger could not encompass the whole symbol without moving, and so could not move rapidly from one symbol to another.”\textsuperscript{115} Thus, he modified it into 6 dots per cell and developed the Braille system.

Braille is one of the few writing systems that used tactile perception. One will require gaining the skill to practice Braille with smooth and efficient touches along the words. One of the methodologies is to use the index fingers of both hands, and “to finish reading the end of a line with the right hand and to find the beginning of the next line with the left hand simultaneously.”\textsuperscript{116}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{braille-figure.png}
\caption{Fig. 3}
\end{figure}

\textsuperscript{115} Idem.
\textsuperscript{116} Idem.
“Land of Silence and Darkness”, film by Werner Herzog

The continual presence of sound is always accompanying us in daily lives. Therefore, it is easier for a blind person to place his or her relationship with the surrounding world. “The brain is one and the world is one because the brain is aware of being in a world. Sound is the fundamental form of that world.” However, what would it be like to be born with deafness? Deaf and blind people are experiencing a totally different world. For hearing/sighted people, it is easier to comprehend the problems of being blind by simply blindfolded for instance. However, one cannot just wear ear-muffs and try to experience deafness. “The sighted person lives in the world as illuminated by the intentions of consciousness. The blind person lives more intensely in consciousness itself, that is, in the flow of thought in which consciousness reaches awareness. Such thoughts are experienced as internal speech, and internal speech can become external speech. So communion is born.” In terms of a deaf person, he or she will be more difficult to develop a full body awareness to experience daily events. It is because he or she may depend on vision and does not pay that much attention to apply the other senses. In other words, blindness will lead to an enrichment of consciousness, and deafness is harder to achieve that.

For the group of deaf-blind, it will be even harder to comprehend their world. In the movie “Land of Silence and Darkness”, director Werner Herzog has totally exposed the senseless world when one is lack of communication skill. He investigates the nature of human reaction, thought and communication by telling the story of Fini Straubinger, a deaf-blind German woman. Her aim is to help the other deaf-blind people and explain their struggles. In this movie, it is very interesting to discover that the deaf-blind people use a unique set of sign language of strokes and taps on palm for communication. (See Fig. 4 & 5) The only senses that they can use are taste, smell and touch with no idea of the existence of speech or sight. Another interesting fact is to observe how the deaf-blind children learn how to pronounce simply words. The sighted teacher will take the hand of the deaf-blind child and put his or her fingers on her lips to feel the vibration of the word. Then the teacher will put the child’s hand back on his or her lips to feel the vibration of the sound when one is trying to pronounce the word. (See Fig. 6 & 7)

In the showering scene of a deaf-blind teenager, it is unbelievable that as simple as taking a shower can be that alien and horrifying to him. The training guide has a great deal of difficulties explaining what a shower is. This scene has really shown the isolation, powerless and loneliness in the world of deaf-blind. From this movie, one has to question on the possibilities of linguistic and the powerful usage of sign language, such as its unique character and the utilization of gesture which are totally independent from spoken language. Tactile sign language can really enhance to another sensory mode, which the deaf-blind can have the possibility to communicate with the others and release from the intellectual disabilities.

---

117 John M. Hull, Idem, 186.
118 Idem.
SCENT

SIGHTED

Odour can have the power to capture and preserve memory of any space, and every space has its own particular smell. “A particular smell makes us unknowingly re-enter a space that has been completely erased from the retinal memory; the nostrils awaken a forgotten image, and we are enticed to enter a vivid daydream. The nose makes the eyes remember.”

When traveling on the streets, one will experience the journey of odour.

The scent sphere of a candy store makes one think of the innocence and curiosity of childhood; the dense smell of a shoemaker’s workshop makes one imagine horses and saddles, harness straps and the excitement of riding; the fragrance of a bread shop projects images of health, sustenance and physical strength; whereas the perfume of a pastry shop makes one think of bourgeois felicity. Fishing towns are especially memorable because of the fusion of the smells of the sea and of the town; the powerful smell of seaweed makes one sense the depth and weight of the sea, and it turns any prosaic town into the image of the lost Atlantis.

In an old country house, it has many levels of smell that are created through time. Comparing to the contemporary architecture, it has lost the scent with sterilized appearance.

BLIND

For the blind people, smell is also an important sense to understand and capture an idea of the space. By using the sense of smell, he or she can recognize one’s location on the street. For example, when Hull was on his way to work and crossed the rough road under the bridge. He enjoyed the smell of the river. He described, “I climb higher, up the hillside, across the rough ground under the bridge which leads to the University car park and up the steps and there it is again! The south-westerly, strong and steady like a stream of power and fragrance. I plough into it, breathing it in and out. I am one with it.”

---

119 Juhani Pallasmaa, Idem, 38.
120 Idem.
121 John M. Hull, Idem, 207.
the street-sweeping machine, he was overwhelmed by the heat and mechanical oily smells. However, once he arrived the foyer of his home, the smells totally changed comparing to the outside. He described, “I am into another world. Once again, like the home, it is enclosed but unlike that warm intimacy, it is large, sharp, clean and impersonal. There is a distant smell of paper and polish…” 122

Odour can also relate to hunger and the desire to consume. When the food is not in sight, he or she can feel the hunger. However, “once the food can be seen, desire for the actual food takes the place of the feeling of hunger, or blends with the feeling, so that one’s energies, attentions, senses of smell and taste are occupied with the anticipation of the perceived food.”123 For the blind people, they cannot see the food, thus the smell of food becomes crucial. However, for the sighted people, the appearance of food will be stronger than its aroma. Thus, when one describes the smell of food, it is often quite general, such as the use of the word ‘delicious’. Because the smell may not be specific, a blind person may become easily bored of food, which is unlike a sighted person, who can perceive the excitement on visual appearance of food along with the aroma that evoke hunger.

122 John M. Hull, Idem, 207.
123 John M. Hull, Idem, 208.
Vision and tactile can attract the sensation of taste, such as colors and textures can play an important role. For instance, the smoothness of the surface can be visually sensed by the tongue. “Our sensory experience of the world originates in the interior sensation of the mouth, and the world tends to return back to its oral origins. The most archaic origin of architectural space is in the cavity of the mouth.”

It is interesting to look at Junichiro Tanizaki’s, a major writer of modern Japanese literature, description of tasting a bowl of soup that creates an interaction of the whole body:

> With lacquerware there is a beauty in that moment between removing the lid and lifting the bowl to the mouth when one gazes at the still, silent liquid in the dark depths of the bowl, its colour hardly differing from the bowl itself. What lies within the darkness one cannot distinguish, but the palm senses the gentle movements of the liquid, vapour rises from within forming droplets on the rim, and a fragrance carried upon the vapour brings a delicate anticipation… A moment of mystery, it might almost be called, a moment of trance.

The rich experience of tasting the soup can also be applied into architectural space, which creates continuous moments of allowing the body to sense the intimacy during the journey.

**BLIND**

Smell, sound, touch and then taste are an essential order for the blind people in order to evoke mystery and hunger. The sense of taste is less direct comparing to smell for instance. The action of taste needs the assistant from the sense of touch, such as the action of putting the food in the mouth. One may believe that without visual stimulation, the sense of taste will be strongly enriched and inspired. Thus, the four taste sensations such as sweet, salty, sour and bitter can be fully accomplished.

Sighted people can also experience tasting in the dark to experience some adventures. One will discover that

---

124 Juhani Pallasmaa, Idem, 42.
125 Idem.
in the world of sensitivity, he or she will explore unknown objects in the dark and experience pure taste with mysterious dishes. Because of this event, sighted people began to think of a blind person’s perspective of eating and tasting. For example, types of food for the dinning in the dark will be boneless meat and finger food. Food such as peas, spaghetti and seafood with shells will be avoided. The idea of tasting soup will also be handled in mugs, which is easier to drink without the aid of a spoon. However, for the blind people, eating will be a daily activity. Thus, they prefer to avoid any mysterious and surprising food. For them, the taste will be remembered along with the name of the food, which is very abstract.
BODY, DIMENSION & SCALE

SIGHTED

The primitive tool of constructing and sensing the space is the body along with the haptic experience. “The architect internalises the landscape, the context and his conceived building in his body: movement, balance and scale are felt unconsciously through the body as tensions in the muscular system and in the positions of the skeleton and inner organs.”\(^\text{126}\) Because of countless generations and traditions, people began to grasp the technique of creating comfortable and protective homes. However, this technique has been lost in modern architecture due to the tendency of mainly focusing on the exterior appearance more than the essence of the interior space. As Eileen Gray has stated, “Architecture of the exterior seems to have interested architects of the avant-garde at the expense of architecture of the interior. As of a house were to be conceived for the pleasure of the eye rather than for the well being of the inhabitants.”\(^\text{127}\) Functionality in architecture cannot be the main focus; comfort and sensory pleasure have to be involved in the experience.

The experience of architecture is inseparable with the body movement in different spatial events. “As we open a door, body weight meets the weight of the door, legs measure the step as we ascend a stair, a hand strokes the handrail and the entire body moves diagonally and dramatically through space.”\(^\text{128}\) For example, the experience at home consists of various experiences with distinct activities, such as cooking, eating, sleeping, bathing and so on. Those events are not visual based, but “related to one’s body, moved through, utilised as a condition for other things.”\(^\text{129}\) In other words, architecture should introduce and express behaviour and movement, along with the proper architectural scale so that the body will feel comfortable. “Understanding architectural scale implies the unconscious measuring of the object of the building with one’s body, and of projecting one’s body scheme into the space in question. We feel pleasure and protection when the body discovers its resonance in space.”\(^\text{130}\)

Since the Renaissance, there are many artists and architects who have done a great deal of investigations and

\(^{126}\) Juhani Pallasmaa, Idem, 46.
\(^{127}\) Juhani Pallasmaa, Idem, 42.
\(^{128}\) Juhani Pallasmaa, Idem, 44.
\(^{129}\) Idem.
\(^{130}\) Juhani Pallasmaa, Idem, 46-47.
studies on the body dimension towards the search of aesthetic architectural scale and proportion, which is called the golden ratio. Vitruvius’ The Ten Books of Architecture (III, Ch. 1), he stated,

Proportion is a correspondence among the measures of the members of an entire work, and of the whole to a certain part selected as standard. From this result the principles of symmetry. Without symmetry and proportion there can be no principles in the design of any temple; that is, if there is no precise relation between its members as in the case of those of a well shaped man.\(^{131}\)

The aim of the proportional system is to create a sense of harmony and consistency in architecture so that the body can feel resonance in the space. One of methodologies that people had used was an architectural foot. It was a reference to the human body in the architectural standards in Mesopotamia, Egypt, Greece, Rome and Europe.\(^ {132}\) The multipes of a foot would affect the dimension in building, thus controled the size of building materials. Others had been used a multiple of palms, hands and fingers as primary references.\(^ {133}\) In Leonardo da Vinci’s Vitruvius Man (See Fig. 8), he applied his perception on body proportions from Vitruvius’ book for architectural standards on buildings, De architectura, which has stated:

The navel is naturally placed in the centre of the human body, and, if in a man lying with his face upward, and his hands and feet extended, from his navel as the centre, a circle be described, it will touch his fingers and toes. It is not alone by a circle, that the human body is thus circumscribed, as may be seen by placing it within a square. For measuring from the feet to the crown of the head, and then across the arms fully extended, we find the latter measure equal to the former; so that lines at right angles to each other, enclosing the figure, will form a square.\(^ {134}\)

The Vitruvius Man is a standard of the “ideal” human proportion. “Divina proportione took the idea of the golden ratio and introduced it to the Renaissance architects.”\(^ {135}\)

\(^{132}\) Idem.
\(^{133}\) Idem.
\(^{134}\) Idem.
\(^{135}\) Idem.
Le Corbusier applied the golden ratio and Vitruvian Man into his Le Modulor system for the scale of architectural proportion, in order to improve the appearance and function of architecture. (See Fig. 9) It is a system based on “human measurements, the double unit, the Fibonacci numbers and the golden ratio.”\textsuperscript{136} He believed that it is the combination of harmonious measurements that suit perfectly in the human scale, which would be appropriate to architectural and mechanical design. The two famous buildings that he had applied his Modulor system into the design are Notre Dame du Haute and Unite d’Habitation.

Oskar Schlemmer from the Bauhaus School took another path of searching for the ideal human form. He was the master of form at the Bauhaus theatre workshop. One of his famous works is “Triadisches Ballett” (See Fig. 10 & 11), which the actors transformed into geometrical shapes. He simplified the physical structure of human body into puppet-like, two dimensional shapes, in order to transform them into architectural forms. “He was fascinated by every movement the body could make; trying to capture it in his work.”\textsuperscript{137} Thus, he turned them into abstracted levels of convex, concave and flat surfaces. The aim of his sketches was to capture the movement of human body.

Fig. 10: Triadische Ballett
When a blind person first lost the sight along with the ability to have proper mobility, he or she will feel very isolated and illusory. “It is not simply that the world becomes unreal when one is not able to see it any longer; one’s own body becomes unreal because it is no longer plunged into a familiar world.”\textsuperscript{138} Once a blind person gets used to his or her body along with the white cane, the cane itself will become an extension of the body instead of a simple object. The body is the tool for a blind person to experience different spaces in the world of sensitivity. The movements of the surrounding that are consisted of different sounds,

\textsuperscript{138} John M. Hull, Idem, 181.
smells and textures are fully experienced by the body. In the case of Hull, travelling on the train can be an interesting occurrence to experience one’s body towards the surrounding. He stated,

If the movements of other bodies are revealed by sound, the movements of my own body are revealed by the fact that it is being made to vibrate, or I feel the sway of the carriage as we round the bend at high speed. I am held back in my seat as we accelerate, and thrust forward as we slow down.\textsuperscript{139}

From this incident, he was aware that the movement of his own body is unsymmetrical to the movements of the other objects on the train. Because of the lack of vision, blind people will have information of movements through external sound, changes of the air current and internal sensation. However, for the sighted people, they can see whether the train is moving or not. In other words, “you can tell it, as a sighted person, by seeing a changing relationship between your body and the world.”\textsuperscript{140} For a blind person, the experience of motion indicates the separation of the normal relationship between the body and the world.\textsuperscript{141}

The way a blind person experiences his or her house is also very different comparing to a sighted person. As Hull stated, “The house is an extension of my body. It is like a skin, something within which I can move and which is appropriate for the proportions of my body.”\textsuperscript{142} For a sighted person, one can easily develop a sense of belonging in a house. However, for a blind person, it can take up to a few years. “The blind person observes his body, while the sighted person observes the house. The sighted make the house an extension of the body through sight but are not aware of doing so.”\textsuperscript{143} In other words, the sighted people tended not to be aware of their movements, it is just purely the act of moving without much consideration. On the other hand, for the blind people, every step is taken seriously in order to formulate a spatial idea of the place. As Hull explained,

The blind person is aware of the muscular tension which tells him or her how many steps he or she has taken and where the walls now are. After so many steps, I need to reach out and touch. This will enable me to make a course-correction and take the next few steps. There is likely to be a door open and evasive and protective motions must be made.\textsuperscript{144}

A blind person takes a lot of time to understand the space of his or her house with numerous repetitions of

\textsuperscript{139} John M. Hull, Idem, 156.  
\textsuperscript{140} Idem.  
\textsuperscript{141} Idem.  
\textsuperscript{142} John M. Hull, Idem, 177.  
\textsuperscript{143} Idem.  
\textsuperscript{144} Idem.
one’s bodily movements to explore the ratios in order to compare them with one’s scale. As a result, “the body itself became a unit of mobility.”

The studies on senses between the sighted and the blind are essential in order to comprehend that architectural spaces should enhance with rich experiences that can structure the most intimate touches with the body. Every sense is part of a bigger whole. As Hull stated, “The experience of unity of space is not a conceptual unity, formed when we put together the dimensions of height, breadth and depth, using our reason. It is a lived unity, created by the integration of the senses in their relationship with the world.”

The study of the body, dimension and scale is essential to understand that the body is the primitive tool of constructing and sensing the space. “The body knows and remembers. Architectural meaning derives from archaic responses and reactions remembered by the body and the senses.” We hear, touch, smell and taste the world with our bodies, and one will eventually enjoy the fullness experience of the surrounding. “Our domicile is the refuge of our body, memory and identity. We are in constant dialogue and interaction with the environment, to the degree that it is impossible to detach the image of the self from its spatial and situational existence.” In other words, “the world is reflected in the body, and the body is projected on the world.”

---

145 Idem.
146 John M. Hull, Idem, 182.
147 Juhani Pallasmaa, Idem, 43.
148 Juhani Pallasmaa, Idem, 45.
CHAPTER 2: WAYFINDING

Wayfinding is a cognitive process to capture maplike information of the environment. Spatial orientation is “a person’s ability to mentally determine his position within a representation of the environment made possible by cognitive maps.”\(^{150}\) When one is determining the position, distances will be compared. “People are not very accurate in estimating routes in metric units, although they may be able to judge relative distances. Even when distances are compared in nonmetric terms, certain complicated but relatively consistent distortions occur.”\(^{151}\) It is interesting to discover that people tend to refer large spaces into distinct areas. For example, continent will be referred in terms of countries, city will be mentioned into districts, and interior space will be high-lighted into functional areas. The process of forming cognitive map is very important. It transforms the physical environment into simplified forms, contains distortions of distance, and organizes in a less schematic way.

In order to understand the origin of wayfinding, it is worth exploring the invention of a labyrinth and the nature of disorientation. The two labyrinths in the ancient cities, Palombara Sabina and Marina Franca, will be examined, which both ancient towns have applied the labyrinth design for defensive purposes. Spatial orientation and wayfinding for sighted people will be to know where one is and to have an adequate cognitive map aside from the cues in the surrounding. Thus, accuracy on orientation will be an issue. The studies on cognitive maps and the nature of distortion will be very interesting.

In many cases, open angles in cognitive maps will eventually mapped out into rectangles, curved lines become straightened, and spatial configurations are simplified into basic geometric forms.\(^{152}\) There are two common distortions. First, routes appear longer if there are many intersections, barriers, curves and reference points. “The more cluttered a route, the greater the resulting cognitive distance.”\(^{153}\) Second, a person’s liking or disliking of a place will affect the routes distortion.

\(^{151}\) Romedi Passini, Idem, 39.
\(^{152}\) Romedi Passini, Idem, 40.
\(^{153}\) Romedi Passini, Idem, 39.
For the blind people, the methodology and requirement of wayfinding will be totally different from the sighted. Thus, the wayfinding methodology of the blind people will be fully explained. The experience of blindness between recently and congenitally totally blind adult will be very different. This will be explored in the studies of wayfinding development of blind baby and the experiment by Romedi Passini and Guyltne Proulx, *Wayfinding without Vision: An Experiment with Congenitally Totally Blind People*. Echolocation is an essential wayfinding technique of the blind. For instance, Daniel Kish is an excellent example, who has applied this technique in daily basis. The studies of bats’ navigational system, the invention of sonar and the architectural approach of the Hythe Sound Mirrors will also be introduced. The difference to experience travelling between the sighted and blind is very appealing. Sighted people tend to associate the look of the city with the name of the place. For the blind people, they have to apply their own perception, and imagine the appearance and atmosphere of the city. For that reason, one has to aware and focuses on body movement while experiencing the place.
SIGHTED

Labyrinths and Disorientation

Spatial orientation allows “people an idea of surrounding space, of their positions in that space, and they allow purposeful movement within that space.”¹⁵⁴ In daily basis, people are also aware of one’s position in space. However, if everything is working according to plan, then he or she will not be able to notice the mental orientation process. On the other hand, when one gets lost, then the experience of searching for the way will be a memorable experience. Thus, the invention of a labyrinth is very well-known to disorientate and, or entertain people, which has appeared at least 5000 years and used in different cultures.

There are two types of labyrinth designs. The first type is called unicursal, which is created from an older origin. It is like a spiral form that has a unique path that leads one to the center and then out again. The aim is to let the visitors to understand the spatial arrangement and one’s position in it. The second type is called multicursal, which is developed after the Italian Renaissance as the hedge mazes. This type of design is “composed of a number of paths, forking, intersecting, and possibly leading to impasses or dead ends.”¹⁵⁵ The aim of this design is to challenge one’s orientation skill in order to find the exit. Even the simplest form of a labyrinth creates a spatially complex path. “Complexity is by definition not easily grasped; it is associated with unpredictability, the unknown, and the mysterious.”¹⁵⁶

Another usage of the labyrinth is to evoke the fear of disorientation, which can be very effective to exclude the unwanted. For example, the entrances to Egyptian pyramids were organized with complex designed underground passages. (See Fig. 12) “As can be seen from the plan of the entrance to the pyramid of Mazghuna (twelfth dynasty), the use of meandering paths and heavy granite plugs weighing up to 100 tons were among the devices to delude intruders.”¹⁵⁷ The layout of the plan is approximately 200 by 170 meters that can successfully disorientate any visitors without the help from the guides.

¹⁵⁴ Romedi Passini, Idem, 1.
¹⁵⁵ Romedi Passini, Idem, 10.
¹⁵⁶ Romedi Passini, Idem, 10-11.
¹⁵⁷ Romedi Passini, Idem, 4.
On the other hand, hedge mazes are designed for entertaining purposes. However, many visitors, including children and adults, are confused with the feeling between anxiety and excitement. Although it will be just the idea of momentarily lost, the garden labyrinths can have the power to provoke excitement, motivation and curiosity.

Complex environments that challenge wayfinding can be highly valued by the user. Even the sensations associated with being lost or with not finding the way can be an exciting experience. It has to be specified that in the labyrinth example certain conditions that might be crucial are met. The person is prepared and chooses to undergo such an experience. He or she knows that the time during which they will feel lost will be limited, and that no real danger a waits. ¹⁵⁸

Fig. 12: Egyptian labyrinth according to Canina.

¹⁵⁸ Romedi Passini, Idem, 14.
Labyrinths in Ancient Cities
Palombara Sabina, an ancient Italian town with 10,000 inhabitants, has developed along the hill where a
castle is located at the top. It is founded in the eleventh century, and is composed of “concentric or spiral
street system winding around a hill.”\(^{159}\) (See Fig. 13-15) The streets are all situated in an irregular pattern,
which travels up and down the hill in a clockwise direction. The houses are built in a dense manner, where
streets are too narrow for a view up to the castle.

Another ancient Italian town with the labyrinth design is Martina Franca in Puglia. It is founded in the tenth
century with approximately 20,000 inhabitants. (See Fig. 16-18) Similar to Palombara Sabina, the houses
are constructed very close together, along with chaotic street network. “The streets are often narrow, always
crooked, and usually end in impasses.”\(^{160}\) Because of the irregular pattern of the streets, the experience of
getting lost is expected. As the Italian historian Montuori has stated:

Getting lost in this labyrinth is a natural occurrence. Only a few reference points mark the urban fabric
there is only one square, two major churches. The door and window decorations of residences belonging
to the bourgeoisie, although different from one another, seem all to be made by the same family of
artisans.\(^{161}\)

The feeling of disorientation can be disastrous along with frustration and anxiety. As Kevin Lynch has stated in
*Image of the City*:

Let the mishap of disorientation occur and the sense of anxiety and even terror that accompanies it reveals
to us how closely it is linked to our sense of balance and well being. The very word “lost” in our language
means much more than simple geographical uncertainly: it carries a tone of utter disaster.\(^{162}\)

Both ancient towns have applied the labyrinth design for defensive purposes. At the present, this
characteristic has gained some excitement in the exploration. “The irregular curves and open-angled
intersections make it very difficult for the visitor to situate himself. At moments he will wonder where the
streets will lead him and, when finally recognizing one landmark or another, there is the thrill of the puzzle
solved or the surprise of the unexpected.”\(^{163}\)

\(^{159}\) Romedi Passini, Idem, 15.
\(^{160}\) Romedi Passini, Idem, 17.
\(^{161}\) Idem
\(^{162}\) Romedi Passini, Idem, 21.
\(^{163}\) Romedi Passini, Idem, 22.
Fig. 13: Heart of Palombara Sabina.
(Drawing by Lorenzo di Paolis)

Fig. 14

Fig. 15: Aerial view of Palombara and a labyrinth engraving by Hieronymus Cook.
Fig. 16: Aerial view of Martina Franca

Fig. 17: Juxtaposition of streets in Martina Franca

Fig. 18: Typical dead-end street in Martina Franca.
Spatial Orientation and Wayfinding
The sense of orientation has the same meaning as to have the sense of direction. It is “an ability to maintain a
direction while moving, or to point to a direction independently of one’s location in space and independently
of cues originating from the environment.”164 In other words, it is about “knowing where one is and with
having an adequate cognitive map.”165 In general speaking, it is quite difficult for many people to have
that kind of ability. It is also impossible to have “pure” sense of direction, which means to maintain the
sense of direction independent from any information in the environment. One of the studies in Shemyakin’s
Orientation in Space has proven that “pure” sense of direction is impossible.

100 trainee pilots were lined up. They were all blind-folded and ordered to march directly forwards. At
first they walked straight ahead, then some of them began to turn to the right, others… to the left and
gradually began to walk in circles and back track.166

Another interesting fact about the awareness of one’s wayfinding and the sense of orientation is that they are
affected by the level of relieve and efficiency to the final destination. For example, during the first driving
lesson, one will be fully aware of the complexity to function properly with the mechanical parts in order to
reach the destination. However, once experienced, then the complicity will be eliminated, and one can freely
talk and drive at the same time. During that moment, the process of wayfinding will not be noticeable.

Accuracy on Orientation
There is an error margin of 5 degrees when one point out the location and then compare the result on the
map. (See Fig. 19) However, 5 degrees in error may seem very little, but it actually “misses the destination
by about 100 meters for one kilometre and by 1000 meters for 10 kilometres distances.”167

![Fig. 19 A directional error of 5 degrees.]

165 Romedi Passini, Idem, 35.
166 Romedi Passini, Idem, 29.
167 Romedi Passini, Idem, 30.
Cognitive Maps
There are two important publications that put a lot of effort into exploring the importance of cognitive maps: *The Image* by Boulding in 1958 and *The Image of the City* by Lynch in 1960. Boulding has stated that “in order to understand what people do, one has to understand what people know or, more precisely, what they believe they know.” An image is the product of how people understand their physical and non-physical environment. “Clear images of an environment contribute to a person’s efficient functioning, in particular to his wayfinding performances.”

There are two types of cognitive maps: linear and spatial. (See Fig. 20 & 21) Linear cognitive map shows one’s movement in space, which is often created by recalling the walking route. Thus it is also called as route map. “Time provides a means of ordering environmental information (one thing after another) and of dealing with complexities (one at a time).” On the other hand, spatial cognitive map is free from one’s specific position and movement. The setting is seen as a spatial subject, and it is referred as a survey map.

There are three ways of obtaining information from the spatial environment: egocentric frame, fixed frame and coordinate frame. In an egocentric frame, elements are relative to one’s position; in a fixed frame, elements and the viewer are related to a specific location; and finally in the coordinate frame, “elements in the environment are positioned in relation to some abstract system.” It is also related to the order of cognitive thinking during the development of the child. From the age up to seven, a child tends to see things in a linear manner. As the age increases along with more active exploration, spatial thinking will eventually develop.

Fig. 20: Linearly and spatially organized map at building scale.

Fig. 21: Linearly and spatially organized map at the urban scale.

---

168 Romedi Passini, Idem, 35.
169 Idem
170 Idem
171 Romedi Passini, Idem, 37.
172 Romedi Passini, Idem, 38.
Cognitive Distortion
Cognitive maps contain lots of distortions which are affected by one’s familiarity of the place. As one knows the place more, the size of it will become more important. In the example of the shopping complex Bonaventure, the square along with the entrance leading to the metro system are understood as the most important place, thus it is unintentionally drawn out of scale. It is proven that “metric distortions in cognitive maps manifest themselves in differences between cognitive and real distances.”\textsuperscript{173} There are two major conditions that cause cognitive distortions: clutter effect and valence. The clutter effect is referred when there are so many obstacles on the route that increase the distance.\textsuperscript{174} The term valence means the degree of one’s liking or disliking of a place. As one likes a place it will seem shorter in cognitive distance. Another interesting reference is “large spaces are often mapped by regrouping spatial elements into distinct areas.”\textsuperscript{175} For example, a continent will be referred to countries, a city to districts, and an interior space to functional areas. “If two elements are situated within the same area, the distance will tend to be assessed as being shorter than if the elements are in two distinct areas.”\textsuperscript{176} The indication of distance and time are used interchangeably.\textsuperscript{177} For example, when one asks how far a place is, in normal cases, people tend to refer that by the amount of time to get there. “Time expresses the experience of moving through space, and distance is an abstraction thereof.”\textsuperscript{178}

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{173} Romedi Passini, Idem, 39. \textsuperscript{174} Idem \textsuperscript{175} Idem \textsuperscript{176} Idem \textsuperscript{177} Romedi Passini, Idem, 40. \textsuperscript{178} Idem
\end{itemize}
\end{footnotesize}
BLIND

Wayfinding Methodology
There are four basic awareness of wayfinding for the blind people. First, smooth and open spaces with reverberation are not preferable, because there are no orientating signals. (See Fig. 22) Second, it will be easier for the blind to mark out the route by steps, little hills and valleys, because they distinguish the route with sections. (See Fig. 23) Third, the existence and direction of the stairs are essential, and the number is immaterial. (See Fig. 24) Fourth, surfaces must apply lots of changes in texture in order to gain the contrast of sound from one point to another. (See Fig. 25) The following are Hull’s extensive explanations:

What blind people find difficult are smooth, open spaces. It is just these areas which are assumed by many sighted people to be best for blind people, because there is no danger of tripping. From the blind point of view, however, a flat, open surface is not negotiable because there are no orientating signals. There is no structure. It is not predictable, because it may end at any moment, and there is no way of telling where you are, once you are on it. The problem for the blind person is not falling over, but knowing where he or she is. For this reason, it is easier to find my way around a campus which is marked out by steps, little valleys, low walls and lots of changes in texture, because I can mark out my route with sections. The structure becomes sequence when I am moving through it.179

Another important fact is that blind people never walk in the center of the street. (See Fig. 26) He or she always walks along the wall with the white cane detecting the front and the two sides. However, the blind person may also use one hand to touch the wall in order to obtain tactile information. Applying hearing allows the blind person to have a bigger range of detection, not just the frontal and the two sides of exposures. Thus, the navigational technique of echolocation is vital for a blind person to expend the capacity of mobility.

179 John M. Hull, Idem, 94.
No smooth and open spaces with reverberation, because there are no orientating signals.

Fig. 22

Routes marked out by steps, little hills and valleys, low walls, so that the blind can mark out the route with sections.

Fig. 23
The existence and the direction of the stairs are essential, the number is immaterial.

Fig. 24
Must apply lots of changes in texture.
Fig. 26
Blind Baby’s and Recently Blinded Adult’s Wayfinding Development

The wayfinding development of blind baby is worth examined in order to understand the natural process of navigation of recently blinded adult. From the study by Selma Frailberg, *Insights from the Blind: Comparative Studies of Blind and Sighted Infants*, blind baby does not reach out for things. He or she has blind fingers, thus develops into a blind body.\(^{180}\) The reason that blind baby does not reach out for toys that make noises is because it is “the sight of the thing making the noise which encourages the baby to believe that there is something there which can be touched.”\(^ {181}\) For sighted baby, the visual appearance of an object helps him or her to collect memories of its sound and tactile information. Because blind baby does not have that privilege, “there is nothing for the experiences of touch and hearing to be embedded in, nothing to hold them together.”\(^ {182}\) Thus, blind baby is usually slower than sighted baby in the first developmental stage.

The problem that blind baby has faced is very similar to a recently blinded adult. A sighted person tends to associated sound with visual image. For example, the sounds of traffic will lead to images of moving vehicles on the street. Once vision is lost, one will continue to apply visual images into the acoustic world. However, soon one will become unsatisfied due to the lack of “correspondence between the acoustic world and the visual world, and because of the insubstantial and intermittent nature of sound.”\(^ {183}\) The only method to overcome this difficulty is to accept that sound is dependent from visual clues, and treat the acoustic world as pure wayfinding indication. It is common for a recently blinded adult to “pass through the developmental experience of the blind baby by means of a vast and painful detour which involves the unlearning of one’s whole life in the world.”\(^ {184}\) One has to learn that ears cannot substitute vision. As Hull has stated,

> It is just because of the striking contrast between the seen world and the heard world that it is so difficult to put them together. It is a tribute to the remarkable genius of nature that when the world of sight and the world of sound have been made coherent by the intelligence of perception, the resulting coherence is so effective that we become entirely unaware of it, taking it for granted as the way the world is, not as an achievement of human development. This coherence is destroyed by the loss of one of the senses.\(^ {185}\)

---


\(^{181}\) *Idem*.

\(^{182}\) *Idem*.

\(^{183}\) *Idem*.


\(^{185}\) *Idem*.
As a blind baby, the first initial experience is the sound and touch in the mother’s arms. The feeling of intimacy is an essential need for the blind as well. It is also the reason that why blind people like to live close to other people. It is merely because of the need of help and sympathy. It is because “the coherence of sound and touch, upon which the unification of the blind person’s world rests, is rooted in experience of other people.”\(^\text{186}\) In other words, it is the need of intimacy and understanding.

\(^\text{186}\) John M. Hull, Idem, 180.
Wayfinding without Vision: An Experiment with Congenitally Totally Blind People by Romedi Passini and Guyltne Proulx

In the experiment, there were a group of 15 congenitally totally blind subjects and 15 sighted subjects guided through a complex architectural setting. After two guided tours, they had to navigate the journey on their own. “The purpose of the study is to identify aspects of decision making/executing and information processing that is specific to the visually impaired population and that have a bearing on the design of appropriate environmental supports.”

Experiment Outline:
1. Identify how the congenitally blind plan a journey.
2. Identify specific wayfinding problems in both groups.
3. Identify the information used by the congenitally blind during wayfinding.
4. Explore the spatio-cognitive competence of the congenitally blind.
5. Compare the overall wayfinding performances between the congenitally totally blind and the sighted group.

Subjects (9 women & 6 men in both groups, aged between 18 and 56):

Congenitally Blind:
- between the age of 18 - 60
- who had been totally blind from birth
- sufficiently mobile to look after their own daily affairs

Sighted:
- matched in terms of sex and age
- in equal numbers with the previous group by professionals, support staff, students and the unemployed

---

Rules:
1. The subject has to describe what he or she has planned to do in order to reach the destination before the experiment.
2. During the journey, they have to verbalize continuously what they are doing and why they are doing it.
3. All the information will be analyzed in terms of decisions, information, and the occurrence of errors.190

Tasks:
1. Identify detours
2. Propose shortcuts
3. Indicate the general form of the building
4. Spatially situate the entrance and exit
5. Trace the route on a given tactile map

5 Route Categories:
1. Corridors
2. Intersections
3. Stairs
4. Open Spaces
5. Thresholds

190 Romedi Passini and Guyltne Proulx, Idem, 233.
### Results:

<table>
<thead>
<tr>
<th>Category</th>
<th>Congruently blind</th>
<th>Sighted</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>- did not identify a door frame of a fire</td>
<td>- saw the end of the corridor</td>
<td>- C.B. formulated in total 78% more decisions than the sighted</td>
</tr>
<tr>
<td></td>
<td>- heater is ruined halfway along a corridor</td>
<td>- paid no particular attention to the door</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- door frame became a reference point</td>
<td>- did not formulate a decision at that point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- led to a specific decision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration targets</td>
<td>Maintain a direction</td>
<td>- more than twice as frequent for the C.B.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- linking architectural elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td>Changing levels</td>
<td>Nothing specific</td>
<td>- C.B. felt more deviation and awareness than the sighted</td>
</tr>
<tr>
<td></td>
<td>- walking structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- finding cleverly combined architectural elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- avoiding overt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References of memoir, 62 units of info</td>
<td>1. building walls, doors, columns</td>
<td>- mental insight such as floor plans, written message on the bulletin board...</td>
<td>- out of the 62 identified units, 58% are referred by C.B., 26% are referred by the sighted</td>
</tr>
<tr>
<td></td>
<td>2. interior furniture, equipment, decoration</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. method (interview):</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>architectural/visual inspection, written</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>context (interview): reasoning, use of the building, weather, wind...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping</td>
<td>-215 produced a final drawing sketch</td>
<td>- 467 produced a final drawing sketch</td>
<td>- 85% produced a final drawing sketch</td>
</tr>
<tr>
<td></td>
<td>- 565 produced a final drawing sketch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 657 produced a final drawing sketch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

191 Romedi Passini and Guyltne Proulx, Idem, 237.
192 Romedi Passini and Guyltne Proulx, Idem, 239.
193 Idem.
195 Romedi Passini and Guyltne Proulx, Idem, 243-244.
In this experiment, it has stated that congenitally totally blind person is:

   capable of learning a relatively complex route, of making the journey by himself or herself, of mapping the route, and of understanding the experienced space sufficiently to have an overall representation of the layout allowing him or her to perform complex spatial operations such as proposing shortcuts… understands the geometric characteristics of a setting to an extent that is comparable to that of a sighted person.\textsuperscript{196}

There are three important design principles for both the sighted and blind people. First, landmarks and key routes should have distinguishable texture in order to enhance the awareness for the blind people. Second, verbal descriptions of the spatially organization of the building is needed for both sighted and blind. Third, similar verbal description of the services provided and the routes to reach those destinations will be helpful for both groups. It is especially important for the blind people who need to generate a detailed decision plan before engaging the action.

\textsuperscript{196} Romedi Passini and Guyltne Proulx, Idem, 247.
Echolocation

Echolocation is a skill that a blind person can develop by focusing on hearing echoes in order to detect any obstacle ahead of him or her without the need of touch. When one can master this technique, he or she will be more involved with the environment with a generalized idea of the acoustic atmosphere. Daniel Kish is an excellent example of applying echolocation in his wayfinding in daily basis. By frequent clicking noises with his tongue, he can run, ride a mountain bike, and explore other various sports without any problem of being blind. Kish has also trained the other blind people to utilize echolocation, which he called echo-mobility. The basic principle of echolocation is very simply. It is very similar to the phenomenon of light and vision. One can visualize the surface from interpreting patterns of reflected light. Sound has the similar characteristics. As Kish explained,

> Vision processes photons (waves of light) as they travel from their source, bounce off surfaces throughout the environment and enter the eyes. Similarly, the auditory system can process phonons (waves of sound) as they travel from their source, bounce off surfaces and enter the ears. Both systems can extract a great deal of information about the environment by interpreting the complex patterns of reflected energy that they receive. In the case of sound, these waves of reflected energy are called “echoes.”

With the technique of echolocation, a blind traveler can easily detect complex information which is located far beyond the reach of the white cane or arm. “Echoes can give detailed information about location (where objects are), dimension (how big they are and their general shape), and density (how solid it is).” Once a person aware of these qualities, he or she can easily detect different specific objects. For example, a pole has the standard characteristic of tall and narrow, thus a blind travel can distinguish it instantly. The form of a shape is essential, which can create and control different sonic atmospheres by reflecting sound waves towards a specific location, such as the forms of concave and convex, expend and conserve. (See Fig. 27) Density is also an important element to perceive echolocation. It provides information of the solidity of the object. “For instance, an object that is low and solid may be recognized as a table, while something low and sparse sounds like a bush; but an object that is tall and broad, and very sparse is probably a fence.” Blind people who do not have specific echolocation training may find the experience extraordinary, such as the case of Hull’s experience:

---

198 Daniel Kish and Hannah Bleier, Idem, 3.
199 Idem
The experience itself is quite extraordinary, and I cannot compare it with anything else I have ever known. It is like a sense of physical pressure. One wants to put up a hand to protect oneself, so intense is the awareness. One shrinks from whatever it is. It seems to be characterized by a certain stillness in the atmosphere. Where one should perceive the movement of air and a certain openness, somehow one becomes aware of a stillness, an intensity instead of an emptiness, a sense of vague solidity. The exact source of the sensation is difficult to locate. It seems to be the head, yet often it seems to extend to the shoulders and even the arms.  

In a noisy environment, it will be more difficult for a blind person to be aware of echolocation. This acoustic guiding system is very useful, which one has to gain some awareness of echoes.

Bartimeus is an association for the blind and visually impaired in Zeist, the Netherlands. In the interview with the mobility trainer to the blind people, Marten van Doorn, he taught me a few lessons of echolocation training. (See Fig. 28) First, Doorn demonstrated how to use echolocation by simply clapping one’s hands blindfolded and walk towards the wall slowly. When I tried it, I could hear the echo of my clapping bouncing back from the wall, thus could stop in front of the wall without hitting on it. Doorn also told me his methodology of training blind people how to find the bus stop without the need of counting of the steps. One has to apply echolocation when walking towards the bus stop. He or she will aware of the sonic differences of the street and the sound shadowing of the bus stop. In other words, it allows the blind to hear the sound waves that bounce off in the surroundings. (See Fig. 29) For training blind children, Doorn always takes them to a forest and challenges them to navigate around the trees without the help of the white canes. From this experience, the blind children can practice their echolocation in a dense area full of vertical objects. One may also wonder how a blind person “visualizes” a space that has never been visited before. (See Fig. 30) There are two methodologies in this case. In method one, a blind person first enters the room and listens to

---

200 John M. Hull, Idem, 23.
its acoustic atmosphere. Second, he or she will explore the four sides of the room. Third, the blind person will take a cross section to search for any obstacles in the room. In method two, the blind person will require some assistance from a sighted person to put a sound source in the room, such as a radio for instance. First, the blind person will enter the room and listen to the sonic reflection from the sound source. Second, one will explore the four sides of the room and observe the reflection of the sound source. Third, the blind person will take a cross section and compare the intensity of the sonic reflection from the sound source in order to “visualize” the space.
Fig. 29
Fig. 30

1. hearing the room

*method 1*

2. exploring the 4 sides of the room

3. taking a cross section to search for any obstacles

1. hearing the room from the reflection of the sound source

*method 2- with sound source*

2. exploring the 4 sides of the room and observing the reflection of the sound source

3. taking a cross section and gaining the awareness of the reflection from the sound source
From the experience of Daniel Kish and his observation of his students over many years, he has discovered some standard detectable measures of using echolocation. The following is his discoveries:

A pole of about an inch diameter can be perceived at about two feet. A fire hydrant may be perceived from several feet away, but not up close unless the student is very short. Likewise, a 4 inch curb is also easier to detect from distances of about 3 to 10 feet, but not too close. A chain-link fence may be detectable at 6 to 10 feet. A parked car may be perceived at 10 or 15 feet; add another 5 feet for a van or truck. A tree may be detectable from 15 or 20 feet. A large building is detectable for hundreds of feet with a strong echo signal. While features in terrains such as mounds, large rocks, up-curbs, or mud puddles may be detectable, drop-offs are almost impossible to detect. Low objects such as curbs seem taller than they are from several feet away. These may be difficult to perceive up close.\textsuperscript{201}

Echoes from large, hard and close objects are particularly easy to detect. But the quality of an echo signal is also essential for blind people’s sonic detection. The most effective echo signals are the ones that the blind can obtain the most information. Therefore, the echoes from cane taps may not be the best echo signal. As Kish explained, “most of the sound just comes back to your feet or cane, and much of that is absorbed or scattered by the ground on its way back. The listener gets something useable, but not as much as if the sound source was closer to the ears.”\textsuperscript{202} For that reason, hand claps or finger snaps can enhance the quality of echo signal, because “the sound returns to a point nearer the ears, so the images are clearer and more useable.”\textsuperscript{203} Another type is tongue click, which the bats are also applying. As Kish explained, “The tongue click elicits the clearest reflections, because the sound reflects right back to the user’s head. Clicks are also short, so the reflection comes back quickly. Clicks can be varied easily in volume or direction to match the requirements of the environment.”\textsuperscript{204} Thus, soft clicks are applied in indoor environment, and louder clicks are suitable for longer distance detection.

Echolocation is very common in nature. For example, the study of bats’ senses will be extremely interesting. They use the ultrasound technique for space orientation while flying in the dark. It is called echolocation, but just for the usage of short distance traveling. The technique is to send out specific echo signals and obtain information of every surface in the environment. In terms of the long distance traveling in the dark, they use

\textsuperscript{201} Daniel Kish and Hannah Bleier, Idem, 8.
\textsuperscript{202} Daniel Kish and Hannah Bleier, Idem, 10.
\textsuperscript{203} Idem.
\textsuperscript{204} Idem.
the Earth’s magnetic field to generate an internal “map sense”. In their ultrasound technique, each bat’s call varies from 14 to over 100 kHz, which is beyond our auditive range. We can only hear sounds lower than 20 kHz, and ultrasound consists of the frequencies of 20-140 kHz.205

The invention of sonar (sound navigation and ranging) has the similar function as the bat’s echolocation. It is the technique of using sound transmission to navigate, communicate or to detect other vessels. “Submarines emit pulses of sound that bounce off the ocean floor, reefs, islands, continental formations, or moving bodies, and return to under water microphones. The returning sounds are relayed via stereo headphones to a specially trained technician.”206 The term sonar also applies on equipment used to generate and receive the sound. The frequencies used in sonar systems are from infrasonic to ultrasonic. The study of underwater sound is called underwater acoustics or hydroacoustics.

The Hythe Sound Mirrors along the southeast coasts of England are the older generation of sonar that are constructed during 1920 to 1930. “They were constructed as listening devices to help in the early detection of German bombers.”207 The large concrete discs were projected out toward the sea, along with the listener in a concrete room under the gigantic disc to detect the murmurs of a sonic environment. Paul Virilio called this invention as virtuality of projection. He stated,

> The speed of the new optoelectronic and electroacoustic milieu becomes the final void (the void of the quick), a vacuum that no longer depends on the interval between places or things and so on the world’s very extension, but on the interface of an instantaneous transmission of remote appearances, on a geographic and geometric retention in which all volume, all relief vanish.208

The form of the Hythe Sound Mirrors is very simple and powerful as well due to the direct connection of its appearance to its functionality.

206 Daniel Kish and Hannah Bleier, Idem, 3.
208 Peter Grueneisen and Peter Maurer, Idem, 02:023.
In human echolocation, it is very simply to comprehend the technique. There are a few things that need to be aware of. As Kish stated, “Large, hard, solid surfaces with concavities or interior angles are usually the easiest to detect at greater distances. Also, objects near the head are typically easier than those below the waist. Large objects can camouflage or overlap small ones that are near them.” Also, in the area with strong ambient noise such as very heavy traffic, the blind people have to apply intense tongue clicking to achieve stronger signals. During rare circumstances such as rain, cold weather and strong winds, they will greatly affect the quality of echolocation. Raining can create a very distracting environment to perceive echo signals. In cold weather, the perception of echoes will be highly improved, because sound waves travel the best in cold air. In terms of strong winds, it is obvious that it will obstruct the quality of echolocation. Once one can practice more often and gain more awareness of the above indications, he or she will gradually enhance mobility.

Daniel Kish and Hannah Bleier, Idem, 12.
Daniel Kish and Hannah Bleier, Idem, 13.
A Blind Traveller

For the sighted traveller, camera will be used to preserve memories of the trip. For the blind traveller, he or she will use another method to collect memories, such as to associate stories with the name of the cities. As Hull explained,

Around the cue-word ‘Ottawa’, I associate my memories of all the people I spoke with, the food I ate, the beds I slept in, and the hands I shook in Ottawa. That is what Ottawa means to me: that collection of memories of human contacts, so different from what is conjured up in the minds of sighted people by the name of cities. 211

Sighted people tend to associate the look of the city with the name of the place. On the other hand, blind people will not have that kind of privilege, thus have to apply one’s perception and imagine the appearance or atmosphere of the city. Thus, a blind person has to focus on one’s body experienced in the place. Therefore, when the place is full of different textures, scents and movements, then it will be easier for the blind to collect memorable pieces and put them into an impression of the place. As Hull stated, “When you are travelling along a road punctuated by lots of houses and trees, you have a definite sense of speed and the passage of distance and time. When you start to travel through the trackless waste, through space or through the desert, through a featureless world, you lose that sense.”212 In other words, it is like collecting small pieces of information and then put them into a bigger picture as Hull has done:

My memory is like the memory of a snail. My body can recollect the narrow little strip of ground over which I have passed, and it consists of tiny details, so tiny as to be irrelevant from the point of view of the cat and the dog. Here the footpath goes up slightly, there is a nick in the kerb, this telephone pole has a metal plate screwed to it but this other one is smooth.213

When a blind person travels on a street, he or she will associate one’s body at various moments along the route. Every major incident happening on the left or right on the route along with the awareness of the change of air current will become important to guide a blind person. As Hull said, “My place is known to me by the soles of my feet and by the tip of my cane.”214

In addition, the website of World Access for the Blind, http://www.worldaccessfortheblind.org/, it offers lots

211 John M. Hull, Idem, 122.
212 John M. Hull, Idem, 122-123.
213 John M. Hull, Idem, 123.
of intense information on blindness and echolocation training. Under the heading of “Documents & Video”,
there are some interesting videos such as Daniel Kish and his explanation on echolocation, along with Brian
Bushway’s story of being a blind man, who is a perceptual mobility coach with World Access for the Blind.
CHAPTER 3: SENSUAL PROJECTS

In this chapter, various visited exhibitions on senses will be examined: Biomapping Workshop, Dialogue in the Dark, Dialogue in Silence, Bartimeus’ Lunch in the Dark, and the Dark Perceptional Space. Along the reflections of these exhibitions, two major projects from Olafur Eliasson will also be studied: The Mediated Motion (2001) and The Weather Project (2003). Both of the exhibitions are mainly focused on visual sensation. Thus, one will get the inspiration to be aware of his or her surrounding, and to question on how we perceive the physical world. In other words, both of the exhibitions are about visualizing your own senses. In addition, all of the mentioned exhibitions have a sequential ordered, which consist of various scenarios. This mythology can enable the visitor to gain more understanding while the time of experiencing the exhibition has extended.

Historical sensory projects such as the ancient Greek and Roman theatres, medieval cathedrals and theatrical design of Italian Renaissance theatre and Symphony Hall in Boston (1900) will be studied. An analysis of the aural history is vital in order to comprehend the development and methodology of constructing an acoustical building that may work technically and theoretically. The purpose of a theatre is to gather devout listeners to enjoy the great masterpieces of the past. Thus, the quality of sound is always the main issue in the design. In the Italian Renaissance theatres, people started to question on the use of spaces, such as the differences on the sizes for the seating, the forestage and the backstage. The shape of the audience seating had also been arranged in order to search for the best sonorous atmosphere for the listeners. Also, materialization had become an important issue to prevent unnecessary reverberation. These valuable studies had been fully applied into the sonic design of the Symphony Hall in the early 20th- century, which was the first auditorium in the world successfully constructed with scientific research with the advice from Wallace Sabine. He had developed a mathematical formula for the acoustic prediction in the rooms, and began the era of New Acoustics. In the section of Modern Sensory Projects, architectural projects that focus on other senses will be introduced. This will be including the Sculpture Pavilion by Aldo van Eyck, the Jewish Museum (The Garden of Exile, Holocaust Tower, and the “Void”), and the Holocaust Memorial Berlin. The matter of time experience can be very interesting in the modern sensory projects. It involves with the relationship between the subject and stationary architectural space. “Historically the subject came to understand the object of architecture through an experience of it in time. The more the subject moved in and

215 Emily Thompson, Idem, 4.
around architecture, the more the subject understood the object.”216 Thus, the method of applying sequential ordering is essential, referents such as a grid, an axis, a marche or a promenade architecturale will be applied. 217 Promenade architecturale means “a sequential ordering of a series of apperceptions in the experience of space.”218 In other words, the time of the experience and the process of gaining the subject’s understanding are connected.

217 Idem.
218 Idem.
EXHIBITIONS

Biomapping Workshop, Delft, the Netherlands. Feb. 25, 2008 at 16:30
The Biomapping workshop is one of the playful workshops in Urban Body to explore our long forgotten senses. We covered one to two of our senses, such as sight and hearing, and then led by another partner to walk through a journey in Delft, from the city center to IKEA. In my case, I had my eyes covered, thus I turned all my attentions to my feet and the sonic environment was more emphasized than before. There are endless expressions for this sensual experience: inspiring, exploration, disorientation, strange… As a result, I turned into an absolute handicapped. This experience has reminded me of the worldwide exhibitions of the Dialogue in the Dark.
Dialogue in the Dark, Hamburg, Germany. Nov. 18, 2008 at 14:45
App. 1 hour 15 minutes, in a group of 10 visitors

Dialogue in the Dark is an exhibition that discovers the unseen within and all around us. The founder of the exhibition, Dr. Andreas Heinecke, held the first permanent exhibition in Hamburg, Germany in 2000. The concept of the exhibition is very simple. The sight is accompanied by a blind guide to explore different scenarios such as park, town and a bar. The wind blows from all directions, the scents are created while birdsong and the sound of a rushing stream are played. The reversion of roles makes the visitors aware that the blind becomes the “sighted”, and the sighted becomes the “blind”. Thus, it makes us questions about our prejudices and stereotypes.

Scenarios outline:
1. Park
2. Carpets Storage in Factory
3. Market
4. Neighbourhood
5. City and the Pedestrian Crossing
6. Wooden Bridge
7. Boat ride in the Harbour
8. Vibration Room with Music
9. Bar

Each of the scenario is separated by a door, thus no visitor can get lost in the dark. The exhibition utilizes scents, wind, temperatures, sounds and textures to create a realistic journey that opens up all your senses other than vision. One may wonder in the complexity of the exhibition, how a blind guide keep on track of the visitors? There are four procedures. First, the blind guide has to recite the names of the visitors before entering to the pitch dark exhibition. Second, the blind guide has to keep in mind of the number of visitors. Third, he or she has to constantly having conversations with all visitors. Forth, from the sound of the visitors’ responses, the blind guide can clearly locate each visitor, and the distances between each person.

Then one may wonder how can a blind guide ‘visualizes’ the exhibition rooms in the beginning? First, one has to have a clear idea of where the entrance and exit of the exhibition space. Second, the concept of the
exhibition must be very clear, such as the order of the scenarios. Thus, he or she will explore each room in order to generate cognitive maps.

The order of the scenarios is composed from calmness to chaos, and then a relaxation section of the vibrating floor and a drink in the bar. The reason behind this is that the visitors can get used to navigate in the dark in a deliberate manner. The Dialogue in the Dark is a remarkable experience where one can really explore the other senses and understand what it is like being in the world of darkness.
Another exhibition that is derived from the Dialogue in the Dark is called the Dialogue in Silence, which is an exhibition on non-verbal communication. It was founded by Dr. Andreas Heinecke and Orna Cohen. The first exhibition was presented in Frankfurt, Germany in 1997 as “Schattensprache”.  

Entering in the world of silence, language has to be visible in order to be understood. Deaf guide will lead the visitors in a small group through the exhibition which is totally sound proof. All visitors have to put on ear muffs and apply nonverbal expressions such as mime, gesture and body language to communicate to one another.

Scenarios outline:
1. Foyer
2. Invitation to Silence
3. Dance of Hands
4. Gallery of Faces
5. Forum of Figures
6. Play of Signs
7. Bar of Silence

In the foyer, the deaf guide will have a simple introduction with the visitors. Once entering into the Invitation to Silence, it is a dark corridor flooded with noise. One will travel through darkness to a silent lighten room. During the section of Dance of hands, visitors are encouraged to explore and play with hand gestures to comprehend how to manual expressed to the others without the need of verbal communication. Afterwards, visitors are led to the Gallery of Faces, where one will be introduced of the adjustable frames system. From this scenario, one will explore facial expressions and the skill to communicate with the others. In the Forum of Figures, one will explore the power of body language. A conversation has to be accomplished with purely body expressions. Approaching to the next scenario of the Play of Signs, the group is divided into two teams to challenge each other. The deaf guide will point to an image on the wall, and the groups have to determine the equivalent symbol. This section is about team work, but the challenge is no verbal communication is allowed. The last scenario is the Bar of Silence, where one can order drinks and snacks by mime and body language. There are some media stations where one can gain more knowledge on sign language and basic

understanding on deafness.

All the instructions are expressed by mime and gesture, thus one has to pay attention and interaction in the exhibition. With the reversion of roles, hearing people are torn out of social routine and familiar reception, and the deaf guides are used to this experience and the ability to express themselves. After the experience of both exhibitions, Dialogue in the Dark and Dialogue in Silence, I consider Dialogue in the Dark is the most powerful and exceptional. The concept is very simple and straight to the point. One just needs to travel in pitch darkness with the alienation of using a white cane in order to understand how difficult a blind person navigates in space. On the other hand, one has to put on ear muffs in sound proof spaces in Dialogue in Silence, but in nature, it cannot be absolutely silence, thus it is not as surprising as the other exhibition. The reason is that one will never totally understand personally in the world of deafness. However, the aim of the exhibition is very clear that it evokes the idea of challenging and questioning on the fundamental idea on deaf and hearing people, and redefines the meaning of disability and ability.
Bartimeus’ Lunch in the Dark & De Donkere Belevingsruimte (The Dark Perceptual Space)  
Zeist, the Netherlands. Nov. 28, 2008 12:00-14:00  
App. 2 hours, in a group of 13 students

During the introduction of the Lunch in the Dark at Bartimeus, a few students were invited to be blind folded before entering into the space. Then Annette, one of Bartimeus’ Instructors, asked them to hear the sonic atmosphere and describe the space. Next, she asked them to hear, touch and smell the unknown substances in the containers, and guessed what were in it. (See Fig. 31) The students were very good in it and got most of the corrected answers. Before having lunch in the dark, everyone was required to be blind folded and then entered the dinning hall. One had to navigate in the space in order to find the dishes and other eating tools. Then the instructors would lead them to the dinning table. One might be amazed how difficult to apply butter and jam on a piece of bread without vision, because it was hard to know how much one had applied. (See Fig. 32 & 33) With the texture and smell of the unknown cream, one needed to apply taste to discover what it was. We had learnt to put a finger in the glass while pouring the drinks, in order to measure the right amount by touch. Also, constant verbal communication with the others was essential to search for sugar, drinks, bread, cheese and so on. At the end, coffee and tea were served while we had a discussion on the consequences. The unexpected aspect of eating without vision for the first experience did not enhance the quality of taste. However, it was the clumsiness that disturbed us.

After the Lunch in the Dark, Annette took us to experience the Dark Perceptual Space. She taught us how to properly use the white cane. Before entering into the darkness, all the students were required to map out the mental maps after the exhibition in order to examine their accuracy in wayfinding with ‘blindness’.

Scenarios outline:
1. Mailbox
2. Bicycle
3. Bridge
4. Park
5. House
6. Car
7. Garbage Disposal Container
The Dark Perceptual Space is a smaller version of the Dialogue in the Dark. Although it was not led by a blind guide, the idea of exploring other senses was very clear. The spaces in the exhibition are very tense, thus one can touch most of the objects in the surrounding. With the help of visual imagination, one can have a better idea of what have been touched. By comparing the mental maps, most of the students have similar results. In most cases, they are not drawn as typical floor plans. Most of them appear as a journey with sequences. It is very obvious that we are architectural students by looking at the drawings. (See Fig. 34)
Olafur Eliasson’s The Mediated Motion 2001 (VISUAL-SENSATION EXHIBITION)

Scenarios outline:
1. Garden with Wood & Mushrooms
2. Wooden Deck Across a Small Pond
3. Sloped Plane of Contaminated Earth
4. Smoky Room with a Hanging Bridge

The exhibition takes place in Peter Zumthor’s Kunsthaus Bregenz. The aim is to question on the visitor’s sense of self presence, and to forget the element of time while visiting the dialogue with the building. Eliasson has stated, “experiencing these spaces, moving through them, allows you to sense the passing of time, I believe, and allows you to sense your own presence – your having a body – when moving in and engaging with our surroundings. This sense is, eventually, what constitutes a space (and you in it).” In other words, he has applied movement to generate space.

For the exhibition on the four floors at the Kunsthaus Bregenz I wanted to involve somebody experienced in cultivation motion. Understanding that the process behind the making of this show – like the weather and the Zumthor building – is inevitably part of the show, I chose to look for somebody experienced with working with outdoor spaces. This led me to landscape architect Gunther Vogt and his studio, whose interdisciplinary collaborations use the nature of the city to engineer areas in which motion is essential.

The four scenarios are the garden with wood and mushrooms; a wooden deck across a small pond filled with growing duckweed; a sloped plane of contaminated earth; a smoky room with a hanging bridge. There are stairs connected them from different floors, which the spaces become the zone of mediated motion. Through a variety of sensory experiences with vision, smells and textures, visitors will eventually gain awareness of one’s movement through space. (See Fig. 35 & 36)

---

221 Idem.
Olafur Eliasson’s The Weather Project 2003 (VISUAL-SENSATION EXHIBITION)
Turbine Hall, Tate Modern, London, UK

In this installation, Eliasson has taken the challenge to explore ideas on experience, mediation and representation. There is a layer of mist covering the ceiling of the Turbine Hall, which creates a mysterious atmosphere, along with an enormous mirror on the ceiling. Thus, it is “replaced by a reflection of the space below.” 222 (See Fig. 37) A giant semi-circular form made up of hundreds of mono-frequency lamps locates at the far end of the hall.223 For that reason, the whole space has transformed into a landscape with a powerful sunset. (See Fig. 38 & 39) “The arc repeated in the mirror overhead produces a sphere of dazzling radiance linking the real space with the reflection. Generally used in street lighting, mono-frequency lamps emit light at such a narrow frequency that colours other than yellow and black are invisible, thus transforming the visual field around the sun into a vast duotone landscape.” 224 In the exhibition space, visitors are also becoming part of the art itself. Along with the warm colors and misty atmosphere, visitors are laying and sitting on the floor to enjoy the unbelievable view. “People start to point and wave, trying to spot themselves, or simply stand and stare, lost in contemplation.” 225 (See Fig. 40-44)

All the constructional structures in the installation are exposed to the visitors on purpose. (See Fig. 45) As Eliasson has stated, “The benefit in disclosing the means with which I am working is that it enables the viewer to understand the experience itself as a construction and so, to a higher extent, allow them to question and evaluate the impact this experience has on them.” 226 Thus, one can walk behind the installation and discover the electrical wiring and the machines that produce the mist.227 “By introducing ‘natural’ phenomena, such as water, mist or light, into an un-specifically cultivated setting, be it a city street or an art gallery, the artist encourages the viewer to reflect upon their understanding and perception of the physical world that surrounds them.” 228 The aim of The Weather Project is to evoke us to be aware of one’s

223 Idem.
224 Idem.
227 Idem.
surrounding, and to question on how we perceive the physical world. In other words, it is about visualizing your own senses.
Fig. 40
HISTORICAL SENSORY PROJECTS

Ancient Greek and Roman Theatres
The Ancient Greek and Roman theatres were the early examples of attempting to apply the acoustical intention into architecture. The reason that the Greek theatres had semi-circular or semi-elliptical forms with raking seating was to locate the audiences closer to the stage so that the actors’ movement and dialogue could be clearly visible and audible.229 “A setting for a theatre would typically be in a natural dishing of the ground where the hillside would permit natural raking of seating rows.”230 (See Fig. 46 & 47) On the other hand, the Romans took an ambitious approach to make steeper seating on top of the masonry instead of a hillside, and a building located behind the stage. This type of design was beneficial for sound reflections from the stage that could produce audible sound. (See Fig. 48 & 49) “Such reflections had only short time delay relative to the direct sound when heard in the auditorium and so speech articulation was aided rather than impaired.”231 Later on with the development of the elliptical amphitheatre, one could appreciate the spectacular overview of the arena.

Fig. 46

Fig. 47

229 Peter Lord and Duncan Templeton, Idem, 7.
230 Idem
231 Idem
Fig. 48 & 49
Medieval Cathedrals
Another approach of applying the acoustical intention would be the medieval cathedrals. However, instead of an open design, the spaces were fully enclosed. Because of the enormous volume with vaults, dense masonry wall and marble flooring as well as the lack of furniture, the reverberation times were 8 seconds and above. Congregation and choir were the only absorption in the space. “The evolution of the form was towards higher and more soaring structures, with height to width ratio up to 4:1. Close sides relative to the height reinforced the reflected sound down from the vaults, stressing the time delay.” Due to the unique structure, the large churches could produce a tone in between the range of A to A flat, which is termed as “sympathetic note”. It had enriched the quality of the organ music, incantation and recital.

A Latin prayer or one of the psalms from the Old Testament could be intoned in a slow and solemn rhythm, carefully adjusted to the time of reverberation. A Latin prayer or one of the psalms from the Old Testament could be intoned in a slow and solemn rhythm, carefully adjusted to the time of reverberation. The priest began on the reciting note and then let his voice fall away in a cadence, going up and down so that the main syllables were distinctly heard and then died away while the others followed them as modulations. In this way the confusion caused by overlapping was eliminated.

Due to the churches’ marked reverberation, the choir had to adjust the singing methodology. Stephen Cleobury, organist and director of music, once stated, “the echo affects how one ends a note; you can shape it and shade it off and the stone will do the rest. You can be gentle. But there are dangers! The letters “S” and “T” come over very strongly. “D” and “F” do not come over so clearly unless you slightly exaggerate.”

The vaults and domes of medieval churches were acoustically effective. A dome as a strong reverberator gave powerful sound focus effects. The Byzantine church of St Mark’s, in Venice, is an excellent example. The combined sound of the reverberation from its five domes formed unique acoustical effect.

St Mark’s had two music galleries, one to the right and one to the left, as far from each other as possible and each with its dome as a mighty resonator. The music was heard from both sides, one answering the other in a Sonata Pian e Forte. The congregation not only heard two orchestras, it heard two domed rooms, one speaking with silver tones, the other responding in resounding brass.

---

232 Peter Lord and Duncan Templeton, Idem, 8.
233 Idem
235 Peter Lord and Duncan Templeton, Idem, 9-10.
236 Steen Eiler Rasmussen, Idem, 238-239.
During the Reformation, changes had to be applied in the acoustical design of the churches. For instance, in St. Thomas Church at Leipzig, Johan Sebastian Bach composed most of his music for the church. The church was composed of three aisles with level vaults. Due to the Reformation, resonant wood had replaced the stone surfaces, thus its great deal of absorption would decrease the amount of reverberation. In addition, all the adjacent walls were occupied with wooden galleries and private boxes. “The encroachment of so many boxes and galleries was due to the Lutheran system of church government which placed the church under the town council. Each member had his own family loge or box, just as one might at the opera.”

Since the replacement to the wood surfaces, it was possible to develop 17th-century musical style of Cantata and Passion with the low reverberation at 2.5 seconds compared to from 6 to 8 seconds in the medieval church.

In terms of acoustical aspect, St. Thomas Church was in-between the Early Christian church and the 18th-century theatre. The greatly carved wooden boxes were located along the walls that covered from floor to ceiling. “The ceiling was flat and relatively low so that it acted as a sounding-board, deflective the tones in towards the boxes where they were absorbed by all the woodwork and upholstery.” Therefore, when the reverberation was shorter, every note in the musical piece would be more distinguishable.

---

237 Steen Eiler Rasmussen, Idem, 239.
238 Idem
239 Steen Eiler Rasmussen, Idem, 240.
Theatre Design: Italian Renaissance Theatre and the Symphony Hall in Boston (1900)

During the early development of the Italian Renaissance theatres, they applied the design method of the Roman theatre into an enclosed design with the use of classical decorations and marble surfaces. As a result, it constantly produced low-frequency reverberation with so many hard surfaces. “In the development of Italian theatre, the scale of forestage in front of the proscenium opening diminished, while the main stage area behind was enlarged to allow ambitious productions and to enable the actors to keep within elaborate sets.”

Teatro el Buen Retiro in Spain (1632) would be an apparent example in terms of the use of spaces. (See Fig. 50) “The seating occupied a small proportion of the hall. The stage space was extended back to hold five sets of wings as well as two sets of multiple back shutters.” The disadvantage with the deep-stage design was the lack of reflective surfaces.

The audience seating arrangement had changed throughout the Renaissance era, from semi-ellipse to a U shaped or egg shaped in plan. (See Fig. 51 & 52) “The advantage of the egg shape was that the front of the auditorium enclosed the forestage with a proscenium splay decorated in the older triumphal arch manner, but which was part of the auditorium ceiling. This enabled actors or singers to give voice within the acoustical enclosure of the auditorium rather than the stage house.” Another acoustical trick would be making a semi-cylindrical hollow below the wooden floor of the stage, which could amplify the sound upwards and could aided the musicians hear clearer notes.

---

240 Peter Lord and Duncan Templeton, Idem, 10.
241 Peter Lord and Duncan Templeton, Idem, 11.
242 Peter Lord and Duncan Templeton, Idem, 12.
Many old theatres and opera houses applied the wood panelling for low-frequency absorption. The multi-balconies produced middle and high frequency absorption. Thus, these would prevent unnecessary reverberation. During the late 18th-century theatre development, domes and other forms were introduced with the use of masonry and plaster or timber. The elimination of multi-balconies along with the above transformations caused many acoustical problems.

During the early 20th century, Symphony Hall in Boston was built, which was the first auditorium constructed with intense studies of acoustic intentions. (See Fig. 53) The plaque located in the lobby of Symphony Hall that dedicated to physicist Wallace Sabine stated:

Symphony Hall, the first auditorium in the world to be built in known conformity with acoustical laws, was designed in accordance with his specifications and mathematical formulae, the fruit of long and arduous research. Through self-effacing devotion to science, he nobly served the art of music. Here stands his monument.\textsuperscript{243}

\textsuperscript{243} Emily Thompson, Idem, 13.
In 1892, Henry Lee Higginson, financier and philanthropist, began the construction of Symphony Hall. His started with the ambition of creating a hall that would produce “sounds from the world”. Unlike the renaissance theatres, he suggested to put a slanted roof that would reflect the sound of the orchestra towards the audience. Instead of using Greek semicircular design, he proposed a rectangular hall. (See Fig. 54) “No concert hall had ever been built in the form of a semicircular amphitheatre before, and there was no way to know ahead of time how such a hall would sound.”

Due to the reason that many rectangular halls did not have a great acoustical result; Higginson began to consult with a technical expert, Wallace Sabine, a professor of physics at Harvard. Sabine thus invested a great deal of time on the intensive study of acoustics with Charles McKim, the architect of the project. They worked together to resolve the problems of the construction throughout 1899 to 1900.

In Sabine’s investigation on acoustics, he divided it into two distinct directions. The first was based on physical principles, and the second on their musical consequence. He explained, “One is a purely physical investigation, and its conclusions should be based and should be disputed only on scientific grounds; the other is a matter of judgement and taste, and its conclusions are weighty in proportion to the weight and unanimity of the authority in which they find their source.”

---

244 Emily Thompson, Idem, 15.
245 Idem
246 Emily Thompson, Idem, 55.
As a result, it was a great success in terms of acoustical quality. Higginson acknowledged Sabine’s contribution and stated, “Professor Sabine has studied thoroughly our questions of acoustics, has applied his knowledge to our problem; and I think with success.” The importance of acoustics played a dominant role in the construction of the Symphony Hall, which had raised the question on the complex combination of science, architecture and music that formed into a great building.

---

247 Emily Thompson, Idem, 17.
MODERN SENSORY PROJECTS

The Sonsbeek Pavilion, Arnhem (1965-66, built 1966, demolished 1966 and then rebuilt at the Kroller-Muller Museum in 2006) by Aldo van Eyck

The Sonsbeek Pavilion is a temporary pavilion for sculpture that served as part of 1966 Sonsbeek exhibition, which was intended to open for a single summer. In 2006, the pavilion has been rebuilt at the Kroller-Muller Museum. “Half hidden by greenery, it appeared from a distance to be scarcely more than a simple, occasional construction, a uniform horizontal volume made of concrete blocks covered by a thin, flat roof.”

(See Fig. 55) The pavilion is a miniature city full of sculptures with comparable sizes to human scale. Thus, it engages the physical contact between visitors and sculptures, especially within the narrow spaces. (See Fig. 56)

For the works of sculpture, small and large, heavy and light, smooth and rough, were not disposed with aloof formality as in a museum. They had come out of their niches to enter the street. They stood clustered in small groups, placidly or gesticulating, in concord or in conflict. They crowded into the squares or lurked behind corners and bends. But whether solitary or social, they all figured as inhabitants of this little city. They behaved as citizens who each reacted in his own way when confronted with the visitor: welcoming or suspicious, friendly or threatening, animated or reserved. They formed a crowd that surrounded the visitor, and through which he would have to thrust his way. Sometimes they were so close together that it was almost impossible to avoid physical contact. ‘Bump! – Sorry. What’s this? Oh hello!’

In stead of applying a grid system in the pavilion, Van Eyck had played around with spaces such as streets, open spaces, corners, alleys, gateways and towers. In other words, it is a maze full of straight and convexities that intersects by bends and diagonal routes. “The pavilion is an example of Van Eyck’s search for labyrinthine clarity, for an alternative to the far-too-easy configurative structuralism, for the reconciliation of opposites (in this case, parallel walls and round forms), for the building as a city – in short, for the entire Van Eyck shebang.”

The spatial design system leads the visitors to walk around the sculpture and observe it from different point of view. As one of the visitors mentioned,

The clever thing about these passages and lines of sight that cross the building in all directions is that you keep coming across the same sculpture from different directions. When the arrangement of an exhibition is all too orderly, you’re inclined to pass by a piece that at first glance looks unattractive. In Van Eyck’s

---

248 Francis Strauven, Aldo van Eyck: The Shape of Relativity (Amsterdam: Architectura and Natura, 1998) 495
249 Francis Strauven, Idem, 495-496.
pavilion, you almost stumble into the sculpture – you come across a piece you originally ignored but it captures your attention after all when you approach it from a different angle. 251

From the side view, the pavilion seems closed and massive. However, in the internal space, the thresholds open the walls sideways and diagonally. Thus, it enhances a multi-directional experience, where visitors can pass in and out, round, between and through the walls. (See Fig. 57) The pavilion is constructed in an area of 25 square metres, which is based on five parallel galleries each 2.30 metres wide and divided by six solid concrete walls. 252 The following is an extensive description of the space from *Aldo van Eyck: The Shape of Relativity*:

The first two streets expanded into ‘piazzas’. Their parallel courses faltered and spread into apse-like hollows of unequal sizes. The other three streets were interrupted after an initial straight section by a construction, their course obstructed by the intruding convex backs of two hollows and by a cylindrical tower in the axis of the fifth wall. The largest ‘apse’, which pushed the space of the second street right across the ‘normal’ path of the third street, established an open centre in the middle of the pavilion. This centre was tempered in two ways. Although located axially, it was linked asymmetrically, through an exocentric doorway, to the piazza on the first street. The two half-cylinders acted together to evoke a whirling motion which swept full-circle to end in the first street in a niche, whose convex back protruded into the centre where it formed an asymmetrical counterweight to the doorway. This motion was reinforced by a diagonal line of sight extending from one extremity of the pavilion to the other. The resulting streets, passages and piazzas presented a far from unequivocal exhibition route. 253

The reconstruction of the pavilion is directed by Hannie van Eyck and Abel Blom. The only element that is different from the original is the roof. It was originally made of simple steel beams structure with translucent fabric. The rebuilt version has similar structure, but the roof is improved with transparent semicircular plastic cylinders. 254 Thus, the element of light diffuses through the translucent roof into the complex labyrinthine architectural space. Through numerous extensive laborious design processes, Van Eyck had successfully created a pavilion with surprising and mysterious exhibition routes that evokes the invitation to explore.

---

251 Francis Strauven, Idem, 496.
252 Francis Strauven, Idem, 498.
254 Piet Vollaard, Idem.
The Jewish Museum in Berlin is designed by Daniel Libeskind, which consists of 15,000 square metres with a twisted zigzag shape. (See Fig. 58) “The museum adjoins the old Berlin Museum and sits on land that was both East and West Berlin before the Berlin Wall fell.” Because of the importance of the site context, the form is derived with some connections of the site. “Libeskind derived its zigzag contours in part from imaginary lines on the city map which connect the site with the street addresses of great figures in Berlin Jewish cultural history… A recurrent basic motif of the design is long parallel or intersecting lines without beginning or end that define sharply pointed, dramatic bodies or spaces.”

The entrance to the museum is from the old Berlin Museum to the underground passages that lead to The Garden of Exile, Holocaust Tower and the “Void”. (See Fig. 59) The Garden of Exile is the only destination that leads to the outside world from the underground passages, which “evoking the idea of exile as the only way to freedom.” (See Fig. 60 & 61) A paved incline ramp leads to the 7 x 7 exhibition space which the ground is tilted along with 49 concrete pillars with oleaster planting, thus the grid does not have the sense of regularities. “Forty-eight of these columns are filled with the earth of Berlin and stand for 1948 – the formation of the State of Israel. The one central column contains the earth of Jerusalem and stands for Berlin itself.”

The sign that locates along the path describes, “49 columns filled with earth are arranged in a square, standing vertically on a slanting floor. Olive willows grow out of the columns. The garden’s form – a square – is the only completely rectangular form in the building.” Below the description, Libeskind has stated, “One feels a little bit sick walking through it. But it is accurate, because that is what perfect order feels like when you leave the history of Berlin.” (See Fig. 62-65) Along with the feeling of disorientated and dizziness in The Garden of Exile, one will discover that the surrounding buildings seem to appear tottering.

Another passageway on the underground floor leads to the mysterious Holocaust Tower, which consists of an empty void of 24 metres high. The concrete tower is dimly illumined from a small opening in its roof, which creates an astonishing atmosphere. (See Fig. 66) The power of echoing in the space such as the sound of footsteps and breathing along with the barely heard of the city sounds can lead to the sense of

---

257 Bernhard Schneider, Idem, 50.
258 Bernhard Schneider, Idem, 40.
isolation and disturbance. “The closed, bare, empty and unheated space, its darkness penetrated only by a sharp beam from its single window, exerts an extremely compelling effect on anyone who experiences it.” 259 In other words, it is the moment of reflection.

The “Void” has the height of 20 metres that cuts linearly through the building. An Israeli sculptor, Menashe Kadishman, creates an installation called Fallen Leaves that fills the void with 10,000 iron faces.260 (See Fig. 67 & 68) The construction of casting the high concrete walls in one piece is very problematic. This project has been a pioneer to test new methodology of handling concrete.261 The sound of echoing is amazing when one walks on the unstable surface filled with iron faces. The coldness from the concrete along with the rusted metallic material of the iron faces in an irregular shaped void, one cannot escape from the moment of contemplation.

259 Bernhard Schneider, Idem, 51.
261 Bernhard Schneider, Idem, 54.
**Der Garten des Exils**


»Man empfindet eine gewisse Übelkeit beim Hindurchgehen, doch das ist recht so, denn so aus den Fugen geraten, fühlt sich die vollkommene Ordnung an, wenn man als Exulant die Geschichte Berlins hinter sich lässt.«
Daniel Libeskind

---

**The Garden of Exile**

49 columns filled with earth are arranged in a square, standing vertically on a slanting floor. Olive willows grow out of the columns. The garden's form - a square - is the only completely rectangular form in the building.

“One feels a little bit sick walking through it. But it is accurate, because that is what perfect order feels like when you leave the history of Berlin.”
Daniel Libeskind
Holocaust Memorial Berlin, Memorial to the Murdered Jews of Europe, Berlin, Germany, 2005.

The Holocaust Memorial is designed by Peter Eisenman, which consists of 2711 high-density concrete stelae. Each pillar has the dimension of 95 centimetres wide and 238 centimetres long. The height of the concrete pillars has the range from zero to 4.5 metres at the center of the memorial. Furthermore, each pillar tips up to two degrees in different directions. “The spaces between the rows are 95 centimetres wide, thus enabling a single wheelchair to pass through but not two people walking side by side. The intention is that everyone should experience the memorial individually.” Light is an important element in the monument. When the weather is overcast, the concrete will appear dull. Once there is sunlight, it will create sharp-edged shadows. For that reason, it will affect the atmosphere of experiencing the space. “At the very centre of the memorial a disturbing sense of confinement may develop, particularly if other visitors block the view of the seemingly distant perimeter.” The top plane of the pillars appears as a rolling sea. This leads to Eisenman’s metaphorical approach into the design, the ‘field of stelae’. The definition of stelae is stand-alone slabs. In Eisenman’s perspective, the metaphor represents a ‘field of waving grain’, thus there are endless rows of concrete pillars. “There is a hint of ancient ruins in Eisenman’s memorial, the stelae having been compared with the bodies of a vanished culture, with the endless waves of the desert, the ocean or the forests, and with the endless rows of crosses in the war cemeteries of Flanders.”

According to Adolf Loos, architecture is about monuments and graves. “This meant that an individual human life could be commemorated by a stone, a slab, a cross, or a star.” However, after the mass death from the holocaust, the icons of individual life and death are gone. “If it is possible today to make disjunct the relationship in architecture between the time of the object and the time of the subject – that is,

---

262 Die Neuen Architekturführer No. 70: Holocaust Memorial Berlin (Stadtwandel Verlag, 2008) 10.
263 Idem.
264 Idem.
266 Idem.
268 Idem.
270 Tom Avermaete, et al., Idem, 243.
271 Idem.
272 Tom Avermaete, et al., Idem, 245.
to separate the internal time of the memorial object from the time of its experience – then the holocaust is a prime subject.” 273 The holocaust can never be remembered in the form from the past. Thus, Eisenman emphasized “the memory of the holocaust today can only be a living condition in which the past remains active in the present.” 274 The grid of pillars evokes the sense of disturbances and the chaos of the seemingly ordered system. “The context for our monument in Berlin is the enormity of the banal. It suggests that when a supposedly rational and ordered system grows out of scale and exceeds its intended purpose, it in fact loses touch with human reason.” 275 For that reason, the grid does not have the sense of regularities, especially with the tilted pillars. It destroys the illusion of security with no indications of the enter, the entrance, the exit and the destination. 276 Thus, this monument cannot be comprehended in time. It requires a time experience, such as labyrinths. The following is an interesting perspective from Architectural Positions: Architecture, Modernity and the Public Sphere:

The time of the experience of the individual will be the same today as it is fifty years from today. The monument grants no further understanding of the holocaust because no understanding is possible. The time of this memorial, its own duration from top surface to ground, is apart from the time of our experience of it. In this context, there is no nostalgia, no memory of the past, only the living memory of the individual experience in the monument. One has the sense of being lost in space where it is literally impossible to be lost. This feeling of being lost is a disjunction in time. 277

The monument is an expressive piece of art that destroys the seemingly ordered grid and in return, introduces the sense of disturbance when one experiencing the space with irregular geometries of the pillars and the path. It requires the time of the experience of the individual to discover one’s perception of this multi-directional experience.

273 Idem.
274 Idem.
275 Idem.
276 Tom Avermaete, et al., Idem, 246.
277 Tom Avermaete, et al., Idem, 247.
FINAL CONCLUSION

In this thesis, body, senses and architecture share the equivalent amount of importance that enhance the quality to carve a volume into the world of darkness. The understanding of architectural scale involves the measure of the body, and it is inseparable with the body movement. Architecture should express behaviour and movement, along with the proper architectural scale. Thus, both the sighted and blind people will discover resonance, harmony and consistency in space. In order to ensure the quality of designing the space for both users, there are five regulations that have to be applied into the design. First, no smooth and open spaces are allowed, along with the route that marked out by steps, little valleys and low walls, so that the blind can distinguish the space by sections. Second, forms with concavities or interior angles are convenient for the blind people to detect at greater distances by using the echolocation technique. Third, the detection of elements that are nearer to the head will be more distinguishable than those placing below the waist. Forth, it is essential to create distinguishable land marks and key routes through texture and sonic characteristics. Fifth, verbal descriptions of how the building is spatially organized and the types of services offered along with the information of the routes to be taken to reach those destinations are very vital for both groups, especially the blind people. The reason is that the blind people need to generate a detailed decision plan before they engage in the journey. Once all the above regulations are accomplished, one should not forget that the cane itself is an extension of a blind person’s body. The biggest difference between the sighted and blind people is that a blind person takes every step seriously in order to formulate a clear spatial idea of the place. In order to accomplish that, a blind person has to apply numerous repetitions of one’s bodily movements to explore the ratios in order to compare them with one’s scale. For example, a house for a blind person is an extension of his or her body, where one can freely move around in it which is appropriate for the proportions of the body. It is important for a blind person that the home is the refuge of his or her body, memory and identity. In other words, the body itself is a unit of mobility.

The touches of sensual exploration are essential to create a multi-sensory experience. For example, for people with vision, shadows will become an important element to exaggerate the depth and the sense of mystery. On the other hand, for the blind people, sound can provide a three-dimensional atmosphere. In the world of blindness, everything is related to action. Thus, every sound is the cause of activity. The sense of touch is the unconscious of vision that provides three-dimensional information of objects. Thus, materialization is an important issue to avoid the feeling of immaterial and unreal in the space. The use of stone, brick and wood can enrich the sense of belonging and express their age and history. Another interesting fact about senses is that the nose makes the eyes remember, where people can aware of one’s location in space through smell.
Beside the coherence of the five traditional senses, blind people need to experience daily activities with the others. In other words, it is the need of intimacy and understanding. Thus, it will be very interesting for both the sighted and blind to experience and explore together. For that reason, the studies on both groups are essential in order to comprehend the methodology to construct an architectural space that the body can discover its resonance, and to enhance with rich experiences that can structure the most intimate touches with the body.
RESOURCES


Bernhard Schneider, Daniel Libeskind: Jewish Museum Berlin (Munich: Prestel Verlag, 1999)


Daniel Kish and Hannah Bleier, Echolocation: What it is, and How it can be Taught and Learned (Long Beach: World Access for the Blind, 1994)


Die Neuen Architekturfuhrer No. 70: Holocaust Memorial Berlin (Stadtwandel Verlag, 2008)


Francis Strauven, Aldo van Eyck: The Shape of Relativity (Amsterdam: Architectura and Natura, 1998)


Juhani Pallasmaa, Polemics: Architecture and the Senses (Great Britain: Academy Group Ltd., 1996)

Madeleine Grynsztejn, Olafur Eliasson (London: Phaidon, 2002)


O. Stockfeld, *Essays on Vroom and Moo* (Tampere: Tampere University, 1994)


ILLUSTRATIONS

Fig. 1: Emily Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America 1900-1933* (London: The MIT Press, 2002) 116.

Fig. 2: Emily Thompson, *Idem*, 118.


Fig. 4: Screen shots from the movie “Land of Silence and Darkness” by Werner Herzog.

Fig. 5: *Idem*.

Fig. 6: *Idem*.

Fig. 7: *Idem*.

Fig. 8: “Proportion (Architecture),” Wikipedia, 10 Jan. 2001, 19 Aug. 2009 <http://en.wikipedia.org/wiki/Proportion_(architecture)#cite_ref-0>.


Fig. 11: *Idem*.


Fig. 13: Romedi Passini, *Idem*, 15.

Fig. 14: *Idem*.
Fig. 15: Romedi Passini, Idem, 16.

Fig. 16: Idem.

Fig. 17: Romedi Passini, Idem, 17.

Fig. 18: Idem.

Fig. 19: Romedi Passini, Idem, 30.

Fig. 20: Romedi Passini, Idem, 36.

Fig. 21: Romedi Passini, Idem, 37.

Fig. 22: Wayfinding Methodology 1: No smooth and open spaces with reverberation, because there are no orientating signals.
Karin Chow, 2009.

Fig. 23: Wayfinding Methodology 2: Routes marked out by steps, little hills and valleys, low walls, so that the blind can mark out the route with sections.
Karin Chow, 2009.

Fig. 24: Wayfinding Methodology 3: The existance and the direction of the stairs are essential, the number is immaterial.
Karin Chow, 2009.

Fig. 25: Wayfinding Methodology 4: Must apply lots of changes in texture.
Karin Chow, 2009.

Fig. 26: Sectional analysis of navigation between the sighted and blind people.
Karin Chow, 2009.

Fig. 27: Forms and Sound Waves.
Karin Chow, 2008.
Fig. 28: Bartimeus’ echolocation training from Marten van Doorn.
   Karin Chow, 2008.

Fig. 29: Echolocation training of searching for a bus stop.
   Karin Chow, 2008.

Fig. 30: The two methodologies of “visualizing” a room from a blind person.
   Karin Chow, 2009.

Fig. 31: Bartimeus’ introduction.
   Karin Chow, 2008.

Fig. 32: Bartimeus’ Lunch in the Dark.
   Karin Chow, 2008.

Fig. 33: Idem.

Fig. 34: Cognitive map from the Bartimeus’ The Dark Perceptual Space.
   Karin Chow, 2008.

Fig. 35: Madeleine Grynsztejn, Olafur Eliasson (London: Phaidon, 2002) 138.

Fig. 36: Madeleine Grynsztejn, Idem, 139.


Fig. 39: Idem.

Fig. 40: Dan Hill, Idem.
Fig. 41: Idem.

Fig. 42: Idem.

Fig. 43: Idem.

Fig. 44: Idem.

Fig. 45: “The Weather Project 2003,” Idem.


Fig. 47: Idem.

Fig. 48: Peter Lord and Duncan Templeton, Idem, 9.

Fig. 49: Idem.

Fig. 50: Peter Lord and Duncan Templeton, Idem, 11.

Fig. 51: Idem.

Fig. 52: Peter Lord and Duncan Templeton, Idem, 12.

Fig. 53: Emily Thompson, Idem, 14.

Fig. 54: Idem.

Fig. 55: Francis Strauven, *Aldo van Eyck: The Shape of Relativity* (Amsterdam: Architectura and Natura, 1998) 459.

Fig. 56: Francis Strauven, Idem, 497-499.
Fig. 57: Routes of detour, short cut or both.
   Karin Chow, 2008.

Fig. 58: The entrance of Jewish Museum, Berlin.
   Karin Chow, 2008.

Fig. 59: The underground passages of Jewish Museum, Berlin.
   Karin Chow, 2008.

Fig. 60: The underground passage leading to the Garden of Exile.
   Karin Chow, 2008.

Fig. 61: The entrance of the Garden of Exile.
   Karin Chow, 2008.

Fig. 62: The sign of the Garden of Exile.
   Karin Chow, 2008.

Fig. 63: Garden of Exile.
   Karin Chow, 2008.

Fig. 64: Idem.

Fig. 65: Idem.

Fig. 66: The interior of the Holocaust Tower.
   Karin Chow, 2008.

Fig. 67: Menashe Kadishman’s *Fallen Leaves* in the “Void”.
   Karin Chow, 2008.

Fig. 68: The interior of the “Void”.
   Karin Chow, 2008.

For the unlisted images, they are under the right of Karin Chow, 2008-2009.
VALUABLE CONTACTS

**Bartiméus**
Postbus 1003
3700 BA Zeist
T 030 - 69 82 207
06 - 23 88 88 65
www.bartimeus.nl

**Bartimeus’ Mobility Trainer**
Marten van Doorn
m.v-doorn@bartimeus.nl

**Bartimeus’ De Donkere Belevingsruimte Contact**
Annette Westerhuis
awesterhuis@bartimeus.nl

**Bartimeus’ House Investing Advisor**
Marij van den Wildenberg
m.vd-wildenberg@bartimeus.nl