

A photograph of a subway station. In the foreground, there is a dark, wire mesh fence that is out of focus. In the background, a person is walking through the station, which has a high ceiling and concrete pillars. The lighting is somewhat dim, creating a moody atmosphere.

DISCOVERING THE LIGHTNESS OF BEING

In Chinese Metro System

Yuemeng Dai
Master of Landscape of Architecture, RISD
Thesis 2024

CONTENT

Introduction

Chapter 1 Subterranean Machine

08 Endless Corridors

20 Commodities or Humans?

24 Space, Behavior, and Self-Perception

Chapter 2 Invisible Manipulation

32 The Power of Context

36 Case Study

42 Psychology in the Elements

Chapter 3 Design Methods

50 Designed Space

54 Elemental Strategies

66 Expected Effects

Conclusion

Bibliography

Thesis Book written and designed by Yuemeng Dai.

All of the photographs and works by other artists are reproduced and credited for academic purposes. Every reasonable attempt has been made to identify owners of copyright.

Error or omissions will be corrected in subsequent editions.

The original content and design of this book is © Yuemeng Dai, 2024.

Typefaces: Perpetua | Utopia Std (Caption)




INTRODUCTION

When I first stepped into the subway leading to my office, I marveled at the efficiency and convenience of this modern mode of transportation, the metro. Industry has shown its power in this moment, encircling the huge city of 667 square kilometers with a network of 836 kilometers of lines, giving users like me the ability to get to any neighborhood in one or two hours. The entrances to the subway are set at the edges of neighborhoods, and it only takes a 10-20 minute walk to reach your home. Most of the subways in commercial and office areas connect to the ground floors of buildings, connecting the subway space to the city's architecture. Moving around in such an efficient transportation system, an underground straight line was formed in the middle of my work and life, and I gradually moved away from the city above ground.

It wasn't until a tired night two months later, as I squeezed into the subway security checkpoint with the flow of people leaving the office building, that I realized, as I looked ahead at the endless white walls, that something was missing. Industry had unfolded its power, turning the underground city into a mechanized factory, banishing any color that wasn't the same, the creeping slowness, the fast or slow pace, and the real, earthy dampness.

In this rushing underground river, I am just a bubble in the water, a droplets through a pipe, a cardboard box on a conveyor belt.



How can we change this subway environment that suppresses our inner selves?

Can the reimagining of the subway space enhance the diversity of experiences, boosting the vitality of our minds and the energy of our bodies during the commute, and thus regaining behavioral and emotional human agency?

Image source: "Tech Leaders Rephrase the Conversation to Proactively Detect Sensitive Data and Apply Controls." Retrieved from Protiviti Blog, <https://tcblog.protiviti.com/2021/03/31/tech-leaders-rephrase-the-conversation-to-proactively-detect-sensitive-data-and-apply-controls/>

ABSTRACT

As an adjunct to industrial advancement and urban sprawl, subways play a critical role in the daily logistics of transporting countless passengers. While they offer an efficient mode of commuting, they also introduce new potential issues that can suppress passengers' subjective behaviors. In Beijing, the subway lines, extending 519 miles and buried 70 feet underground, encircle the city, resulting in daily commutes of 1-2 hours. The extremely high passenger flow during peak times leads to rapid movement speeds within stations, and the complex subway architecture causes long walking distances and multiple transfers between spaces. Passengers, swept along by the flow of people, temporarily surrender their will to the environment, moving through the system like droplets through pipes until they are ejected at their destinations.

This phenomenon prompts us to contemplate the internal impact of such a constrained experience. Surrounded by white lights, repetitive billboards, and the constant presence of underground walls, do we choose to lose two hours daily becoming unconscious, identity-less cargo, or do we choose to productively experience this time in the subway as walking in a grand parade? In this subterranean labyrinth, our consciousness is dominated by the environment. The loss of agency results in everyone being deprived of the ability to make deliberate choices regarding their actions. This repetitive experience drains our inner strength, altering our expectations of life and perception of the city over time.



The Loch Nescalator, Harry Beck, 1934-01-01



Part 01

Subterranean Machine

01 The Endless Corridor

Since the inauguration of the first London underground line in 1863, subways have witnessed a spread across Europe, the Americas, and Asia throughout the 20th century, ushering public urban transportation into a new era. Originating as a product of steam technology, the earliest subways were plagued with severe smoke pollution and were initially manufactured for freight transport only. It was not until the adoption of electric traction technology in place of steam power that a basic environmental condition suitable for passenger transport was achieved. [1]In the early construction of London Underground stations, designer Charles Holden emphasized function over form[2], thus establishing the tone for subsequent subway development architecture—a modernist design ‘fit for purpose’[2].

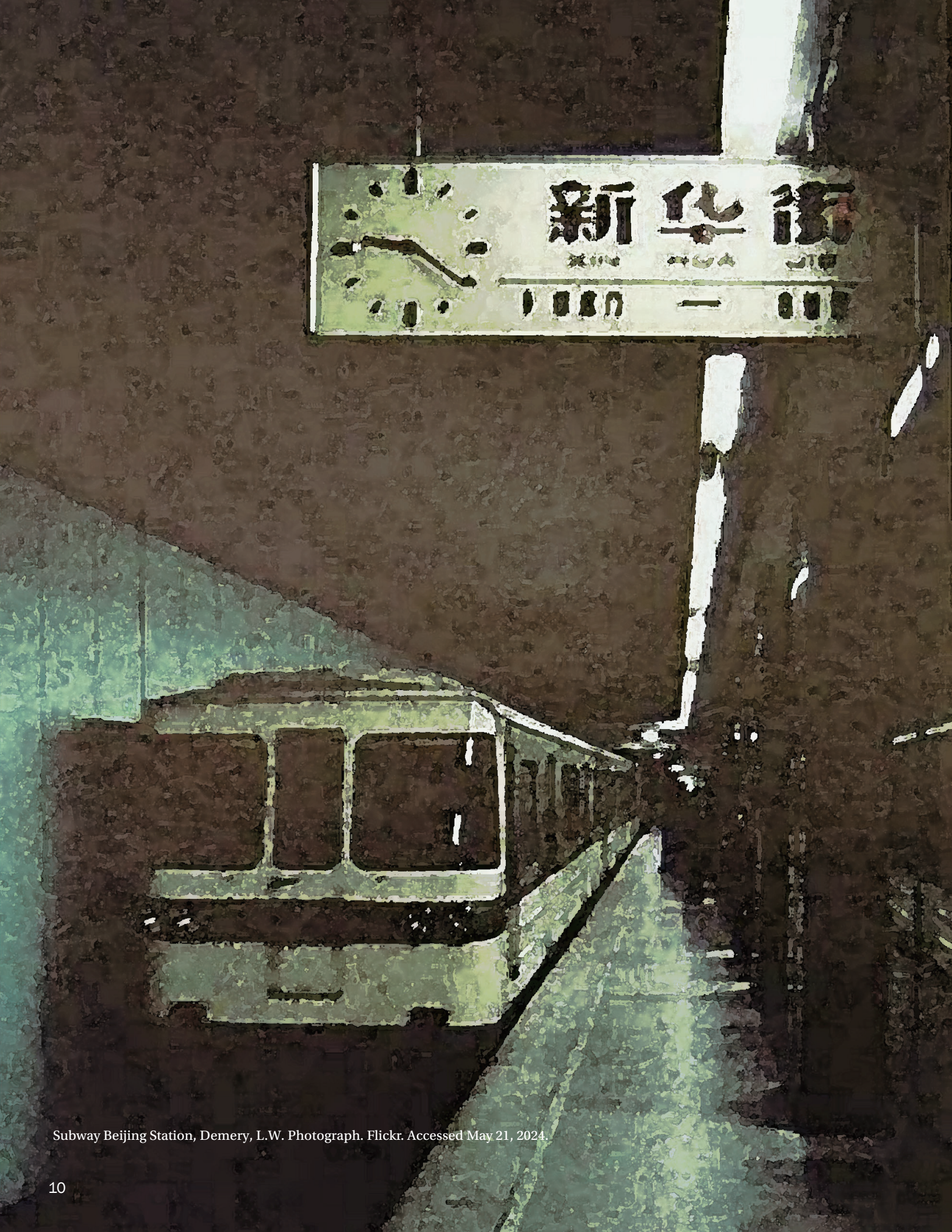
As the 19th century came to a close in America, the subway systems of New York and Boston rapidly evolved, quickly establishing comprehensive modern metro networks. Financial constraints meant that subway designs eschewed art-focused aesthetics in favor of using white and light-colored tiles to foster a bright and welcoming interior environment. Celebrated for their cleanliness, reflectivity, and ease of maintenance, these subway tiles crafted an image of pristine perfection for the New York subway system.[1] They soon became a popular choice in home decor, marking a significant departure from the grimy reputation often associated with subway tiles in contemporary times.

[1]Boorstin, Daniel J. The Creators: A History of the Heroes of the Imagination. New York: Random, 1992. Two or More Books by the Same AuthorBoorstin, Daniel J. The Creators: A History of the Heroes of the Imagination. New York: Random, 1992.Two or More Books by the Same Author

[2]Garreau, Joel. Edge City: Life on the New Frontier. New York: Doubleday, 1991.Garreau, Joel. Edge City: Life on the New Frontier. New York: Doubleday, 1991. Garreau, Joel. Edge City: Life on the New Frontier. New York: Doubleday, 1991.



"City Hall Subway Station." Ephemeral New York. Accessed May 21, 2024.
"Trial-Trip on the Metropolitan (Underground) Railway: The Train Passing the Portland-Road Station." Wood engraving. 1862. Wellcome Collection. Accessed May 21, 2024.
Wikimedia Commons. "Thames Tunnel Train." Photograph. Accessed May 21, 2024.
Hackemann, Jorg. "Subway tile in the New York subway today." Photograph. Accessed May 21, 2024.



Subway Beijing Station, Demery, L.W. Photograph. Flickr. Accessed May 21, 2024.

Following the subways in London and New York, countries such as Canada, Japan, and Russia swiftly embarked on the construction of their subway systems. Perhaps influenced by the entrenched image of subways in Europe and America, despite differences in details, the overall architectural style of these subways has adhered to the London Underground's function-first design philosophy and the New York subway's preference for white and the use of reflective materials like tiles. By this point, the appearance of subway stations had become fixed in the minds of most people. Although the 1980s witnessed a wave of artistic innovation[3], the fundamental design principles remained unshaken.

The first Beijing Subway Line 1 was completed in 1969. Stretching 31 kilometers in length, it features 22 stations and cuts through the center of Beijing. The subway's construction was initially intended not for public transportation but for military preparedness[4]. Amid a severe economic situation, the entire subway line was designed with air defense in mind, utilizing economical yet sturdy materials such as concrete.

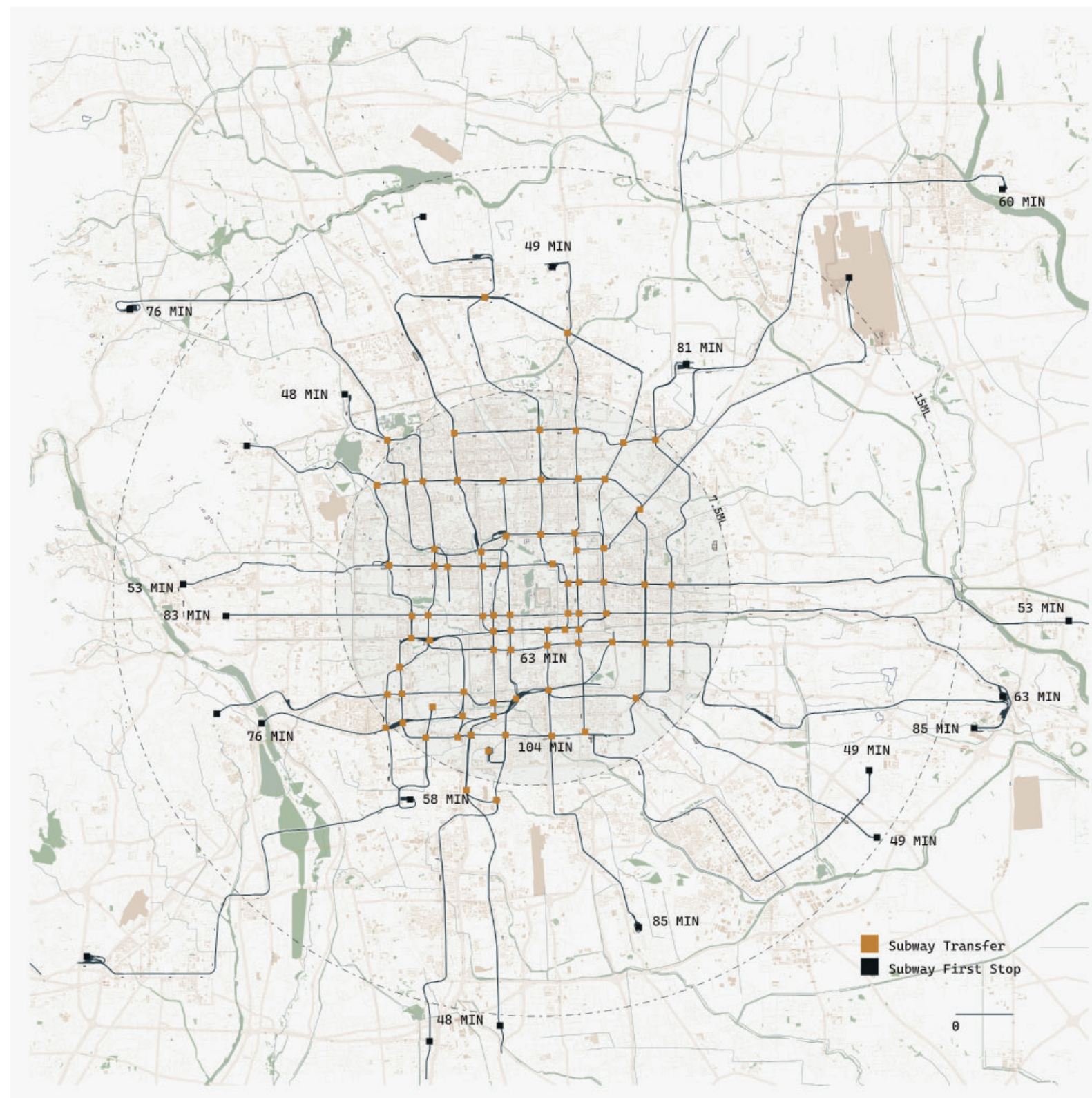
The architecture was designed in a minimalist style, with materials mostly consisting of white or yellow tiles, white columns, angular roofs, metal escalators, and strip incandescent lights. In 1984, the Subway Line 2 was opened, continuing the minimalist style of Line 1. The difference was that Line 2's architecture included more elaborate chandeliers and began to feature simple decorations[4]. Over the next forty years, Beijing entered a rapid phase of subway construction, driven by the city's dramatic expansion and population explosion.

[3] The Nine Nations of North America. Boston: Houghton, 1981. A Book by Two or Three Authors The Nine Nations of North America. Boston: Houghton, 1981. A Book by Two or Three Authors

[4] Atwan, Robert, Donald McQuade, and John W. Wright. Edsels, Luckies, and Frigidaires: Advertising the American Way. New York: Dell, 1979. Signed Article from a Daily Newspaper

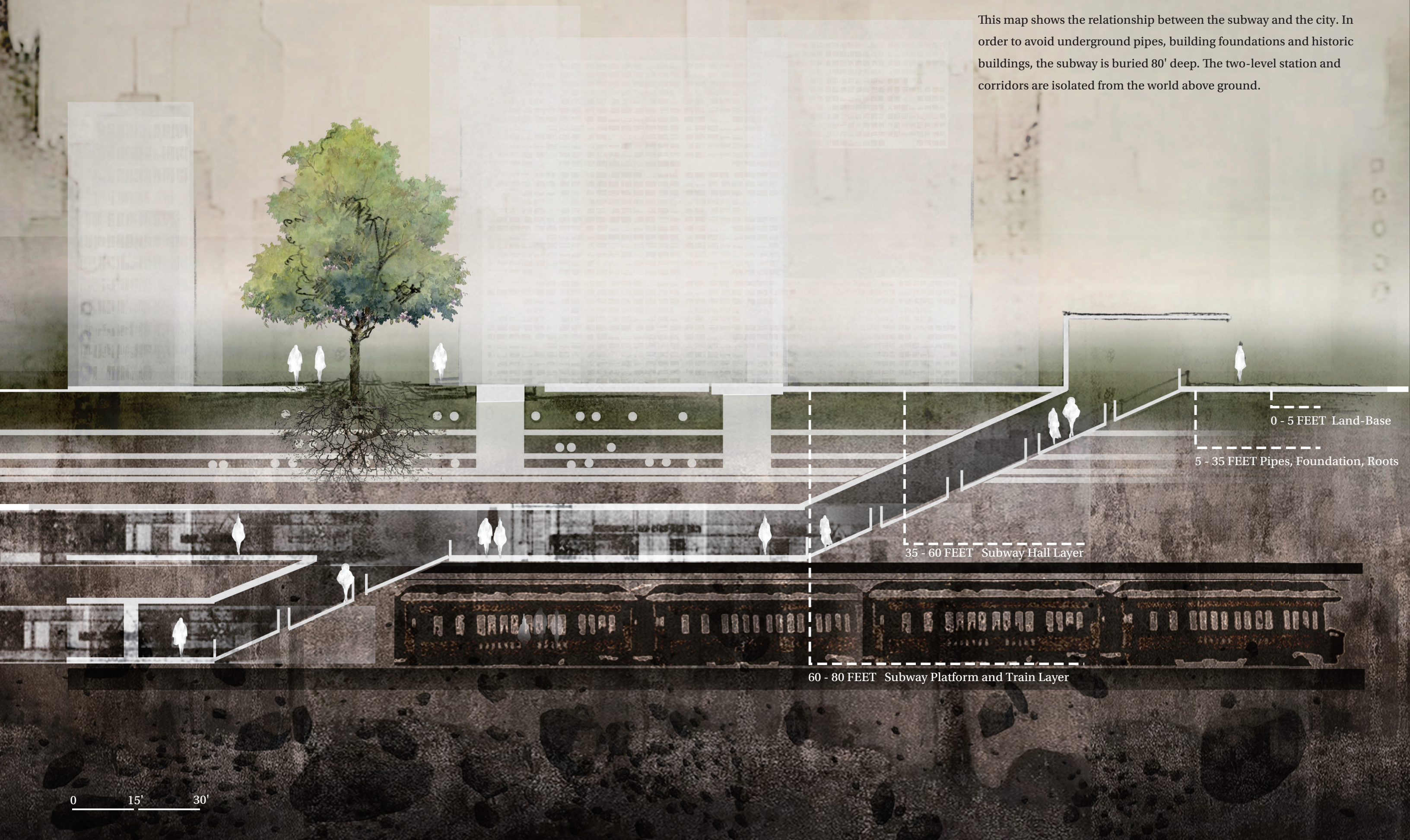
By 2014, Beijing's population had exceeded 12 million, with a density of 9,000 people per square kilometer in the city's core areas. The city's area expanded from 1,043 square kilometers in 2002 to 1,586 square kilometers. Alongside this growth, the subway network expanded from two lines totaling 54 kilometers in 2000 to 18 lines covering 527 kilometers by 2014[5]. The subway lines formed a uniform transfer grid, slicing the city's underground into blocks. Most stations are centrally located in residential and commercial areas. In such a vast modern metropolis, surface traffic congestion has become a persistent problem. In contrast, the subway's speed and cost-efficiency have made it the preferred choice for most office workers and students.

[5]Barringer, Felicity. "Where Many Elderly Live, Signs of the Future." New York Times 7 Mar. 1993, nat. ed., sec. 1:12.



The daily routine of leaving home, taking a five-minute trip to the subway station, traveling underground to near the workplace, and then walking another five minutes to the destination has become the unchanged daily commute for most people. However, it's noteworthy that as the city and subway expand, the daily commute inevitably becomes longer and more complex, transitioning from a single-line ride to requiring transfers across three lines. Due to the different construction eras of old and new subways, the same white corridors often connect them underground, significantly increasing the time passengers spend in subway stations. By 2014, the average one-way trip had reached 52 minutes[5].

This map shows the relationship between the subway and the city. In order to avoid underground pipes, building foundations and historic buildings, the subway is buried 80' deep. The two-level station and corridors are isolated from the world above ground.



0 - 5 FEET Land-Base

5 - 35 FEET Pipes, Foundation, Roots

35 - 60 FEET Subway Hall Layer

60 - 80 FEET Subway Platform and Train Layer

0 15' 30'

While the network of routes within subway stations has expanded, the proportion of public art in new subway lines, which has garnered significant attention, has not increased. Moreover, the public art present within subway stations serves the city's culture rather than its passengers. This approach has not deviated from the original principles established with Subway Line 1, which prioritize economy and functionality, employing minimalist architectural forms and monotonous materials. This raises an important question: Is this unchanging approach still suitable in the current context, with its crowded conditions and lengthy commutes?

GaoDe Map. "Beijing Subway 13 Line." Photograph. JCDecaux. Accessed May 21, 2024.



02 Goods or Human?

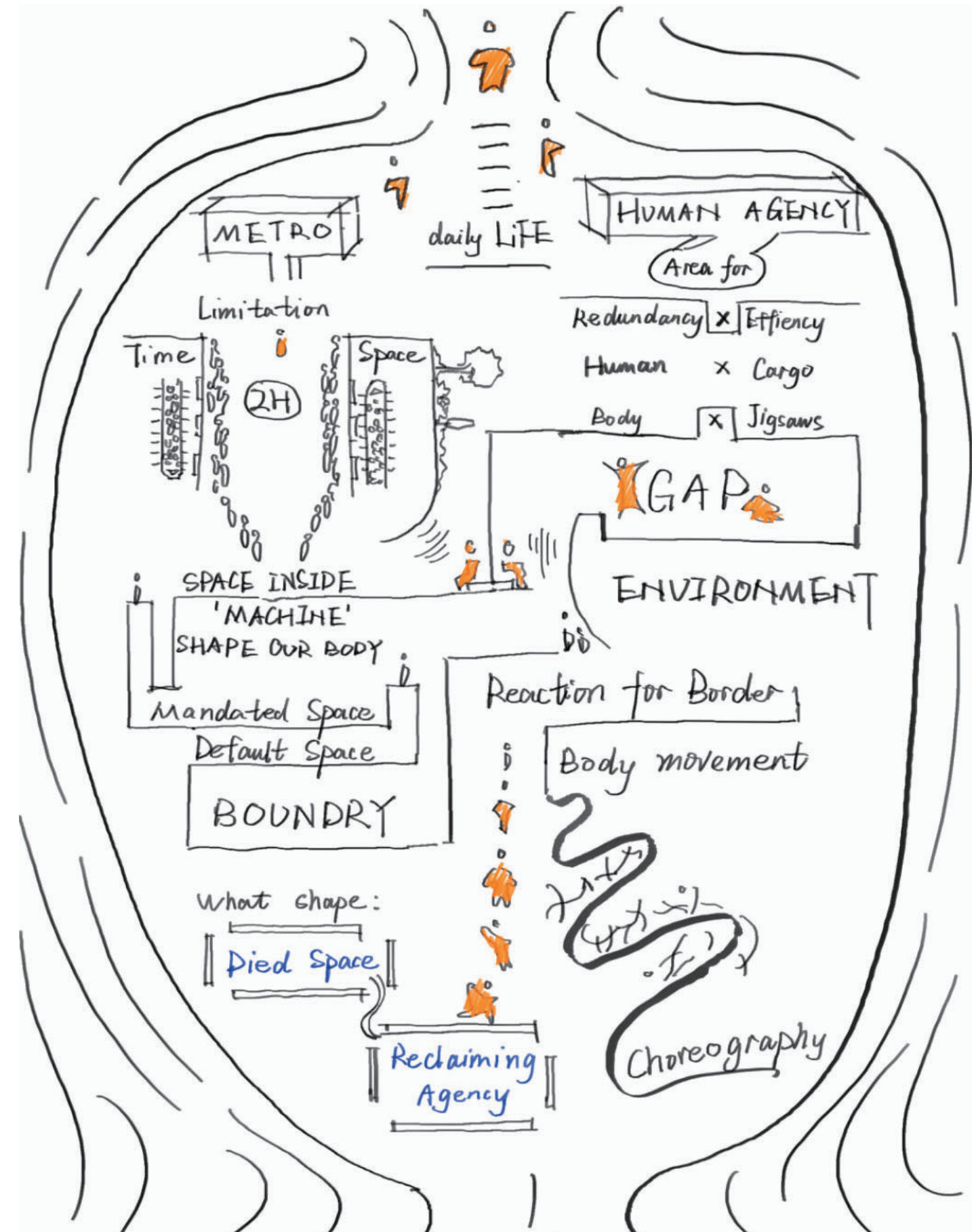
Over the past two centuries, with the advancement of technology and social changes, the human living environment has undergone continuous innovation. From ancient and medieval times, architectural design not only emphasized religion and divinity but also focused on human experience and functionality, as shown by Roman public baths and road systems. The Renaissance and Neoclassical periods further centered on human scale and aesthetics, adjusting spaces to better serve humanity[1]. In the 20th century, modernist architects like Le Corbusier advocated the concept of "a house is a machine for living," emphasizing functionality and simplicity while also valuing light and spatial fluidity to enhance the living experience. Postmodern architecture added historical references and local features based on modernism, focusing on the connection between architecture and the social environment[2]. Recently, sustainable architecture has become a trend, emphasizing environmental protection, energy efficiency, and sustainable materials, reflecting the global attention to ecological responsibility[3].

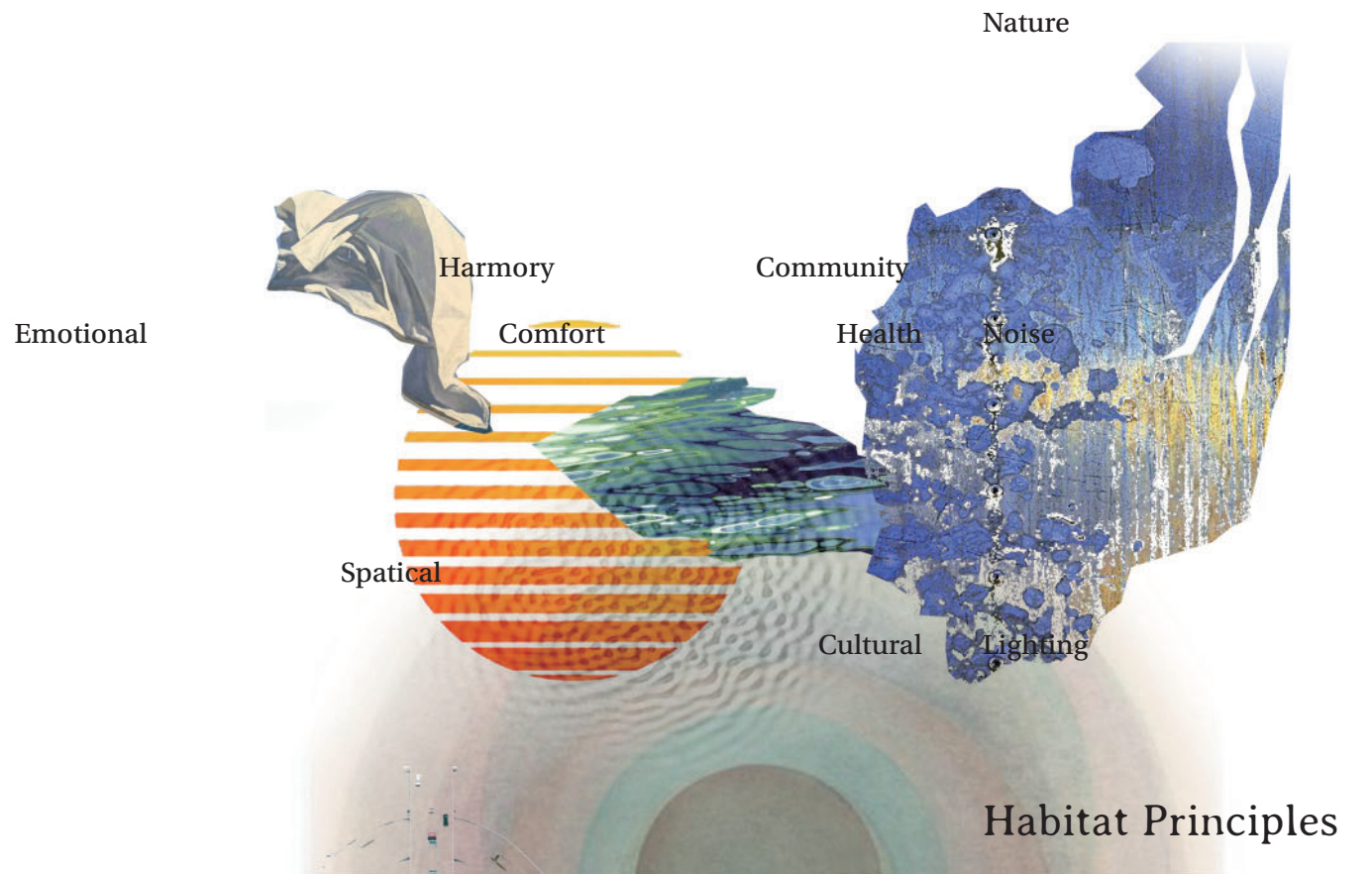
It can be said that the discussion on how to position the relationship between people and architecture has never stopped, constantly oscillating between human-centric and society-praised concepts like religion and industry. In today's era, which emphasizes sustainability, technology integration, and user experience, the subway system—a design product spanning centuries—is also undergoing new scrutiny, namely, how to reposition the relationship between subway users and subway architecture. This scrutiny challenges us to think: Is architecture a machine serving humans, or is it transforming people into compressed cargo in architectural conduits? This discussion provides new perspectives and possibilities for the future design of urban infrastructure and public spaces.

[1]Prasertsuk, Santirak. "Story of Post-Modernism: Five Decades of the Ironic, Iconic and Critical in Architecture." *Journal of Architectural/Planning Research and Studies (JARS)* 11, no. 1 (October 30, 2014): 137–40. <https://doi.org/10.56261/jars.v11i1.23884>.

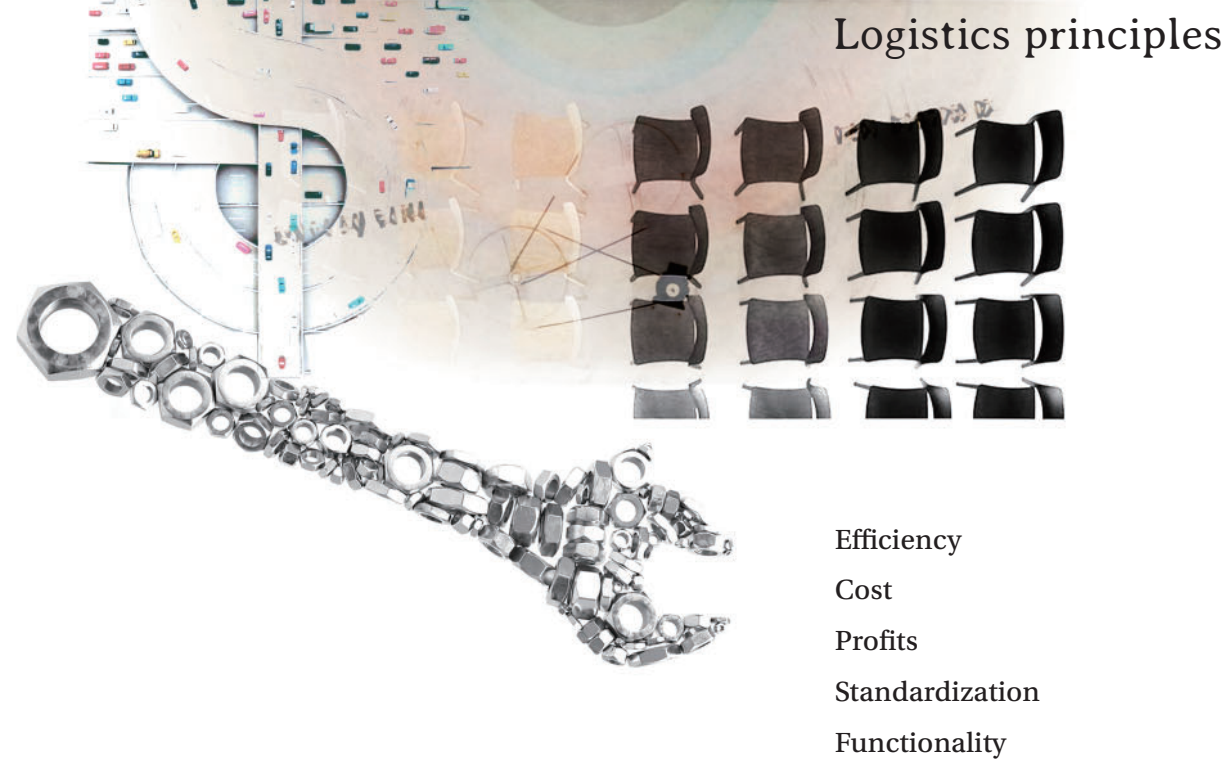
[2]Venturi, Robert, and Vincent Scully. *Complexity and contradiction in architecture*. New York: The Museum of Modern Art, 2019.

[3]Vandevyvere, Han, and Hilde Heynen. "Sustainable Development, Architecture and Modernism: Aspects of an Ongoing Controversy." *Arts* 3, no. 4 (October 14, 2014): 350–66. <https://doi.org/10.3390/arts3040350>.





Which way are we heading?



As an important public transport tool, the original design of the Beijing subway was primarily based on efficiency and economy, reflecting the view of the transport system as a logistics system. "After all, a transportation system is a logistics system for people's movement." [1] Logistics, focusing on the whole rather than the individual and emphasizing the provision of the right products and values at the right time [2], is a theory mainly used in manufacturing. Martin Christopher's *Logistics and Supply Chain Management* suggests that contemporary transportation system design tends to draw from manufacturing models rather than the real needs of residential environment design [2]. This concept has led to design principles that emphasize functionality and efficiency, optimizing spatial layouts and architectural elements to support smooth logistics and human flow. Designs also need to be flexible and adaptable to meet changing demands and optimize resource use and waste reduction.

However, the biophilic design theory proposed by American biologist Edward O. Wilson in the 1980s emphasizes the natural connection between humans and nature and other life forms, which has become a reason for emphasizing direct or indirect connections with nature in later architectural, interior, and landscape designs. [3] Biophilic design includes environmental features, light and space, visual, material, and other elements related to human emotions and experiences, which partly conflict with and differ from the primary principles of logistics-based design principles [4].

The subway system, due to its increasingly important transportation status, has become difficult to define simply as a pure transport tool or residential environment, blurring the boundaries between transport design and residential environment design. Faced with this situation, we must ask ourselves: Do we choose to be cargo on a conveyor belt, or do we wish to be breathing humans? This question challenges us to rethink the design of transportation systems and their impact on human life.

[1] Daganzo, Carlos. *Logistics Systems Analysis: With 4 tables*. Berlin: Springer, 2005.

[2] Christopher, Prof Martin. *Logistics and Supply Chain Management*. United Kingdom: Pearson Education Limited, 2012.

[3] Wilson, Edward O. "On Human Nature." *Religious Studies Review* 6, no. 2 (April 1980): 99-104. <https://doi.org/10.1111/j.1748-0922.1980.tb00039.x>.

[4] Martin, Rory, and Stephen Choi. "Biophilic Design: An Introduction for Designers." *Environment Design Guide*, 2018, 1-15. <https://www.jstor.org/stable/26496280>.



03 Space, Behavior, and Self-Perception

As early as the last century, when cars became the primary mode of transportation, people began to pay attention to the potential impact of the commuting experience on their lives and emotions. Research has shown that the complexity and congestion of public transportation significantly increase stress levels[1]. Additionally, in a study by Lars E Olsson, it was found that the satisfaction level of commuting directly affects people's overall happiness. Factors determining the commuting experience include the mode of transportation, the duration of the commute, and environmental feedback[2]. Experiences of cycling or brief walks are often rated higher than driving or using public transportation. This may be because users see this process as a buffer between work and life, providing a positive impact and making the time spent meaningful and valuable[2].

When we turn to the topic of the Beijing subway, we find that what we question is the seemingly meaningless experience based on a two-hour commute. Passengers cannot engage in activities such as cycling, reading, or sightseeing, which might energize them. Nor can they comfortably give their attention to the subway itself, as the simple and repetitive environment fails to provide sufficient focal points to capture attention like an exhibition might. So, what fundamentally differentiates the subway system space from above-ground travel, and why does it have such a significant impact on the experience?

[1]Wener, Richard E., Gary W. Evans, Donald Phillips, and Natasha Nadler. *Transportation* 30, no. 2 (2003): 203–20. <https://doi.org/10.1023/a:1022516221808>.

[2]Olsson, Lars E., Tommy Gärling, Dick Ettema, Margareta Friman, and Satoshi Fujii. "Happiness and Satisfaction with Work Commute." *Social Indicators Research* 111, no. 1 (2013): 255–63. <http://www.jstor.org/stable/24719141>.

The first reason is the influence of the environment on human self-identity. Bourdieu believes that a person's thoughts and activities revolve around habitus. Spatial forms help people establish identity, express social relationships, and maintain, protect, and extend the durability of these identities and social relationships[1]. Therefore, space is a decisive factor in forming identity and social relationships within an environment. The spaces within the subway and above ground form two different habitus, prompting users to form two sets of self-perceptions and social relationships.

From another perspective, David Cuning mentioned in his article "Agency and Consciousness" that sometimes agents are not aware of what they are doing. He believes that people's experiences drive agents to perform actions that do not require consciousness or thought. The experience of causal relationships has two components: first, the inducement factors in the environment that cause our bodies to react, and then the sensation of our actions being suitable for the environment[2]. This well explains why the same commuting path in two different transportation environments leads to completely different behaviors, ultimately forming different experiences. The spatial shapes, materials, lighting, and other elements in the Beijing subway combine to form a huge implicit symbol, giving passengers a vague and singular identity perception. This ultimately leads everyone to unconsciously perform actions suitable for the current environment based on experience—continuously moving forward—resulting in the loss of inner vitality in the process.

[1]Bourdieu, Pierre, Richard Nice, and Tony Bennett. *Distinction: A social critique of the judgement of taste*. London: Routledge, Taylor & Francis Group, 2015.

[2]Cuning, David. "Agency and Consciousness." *Synthese* 120, no. 2 (1999): 271–94. <http://www.jstor.org/stable/20118202>.
Signs of the Future." *New York Times* 7 Mar. 1993, nat. ed., sec. 1:12.



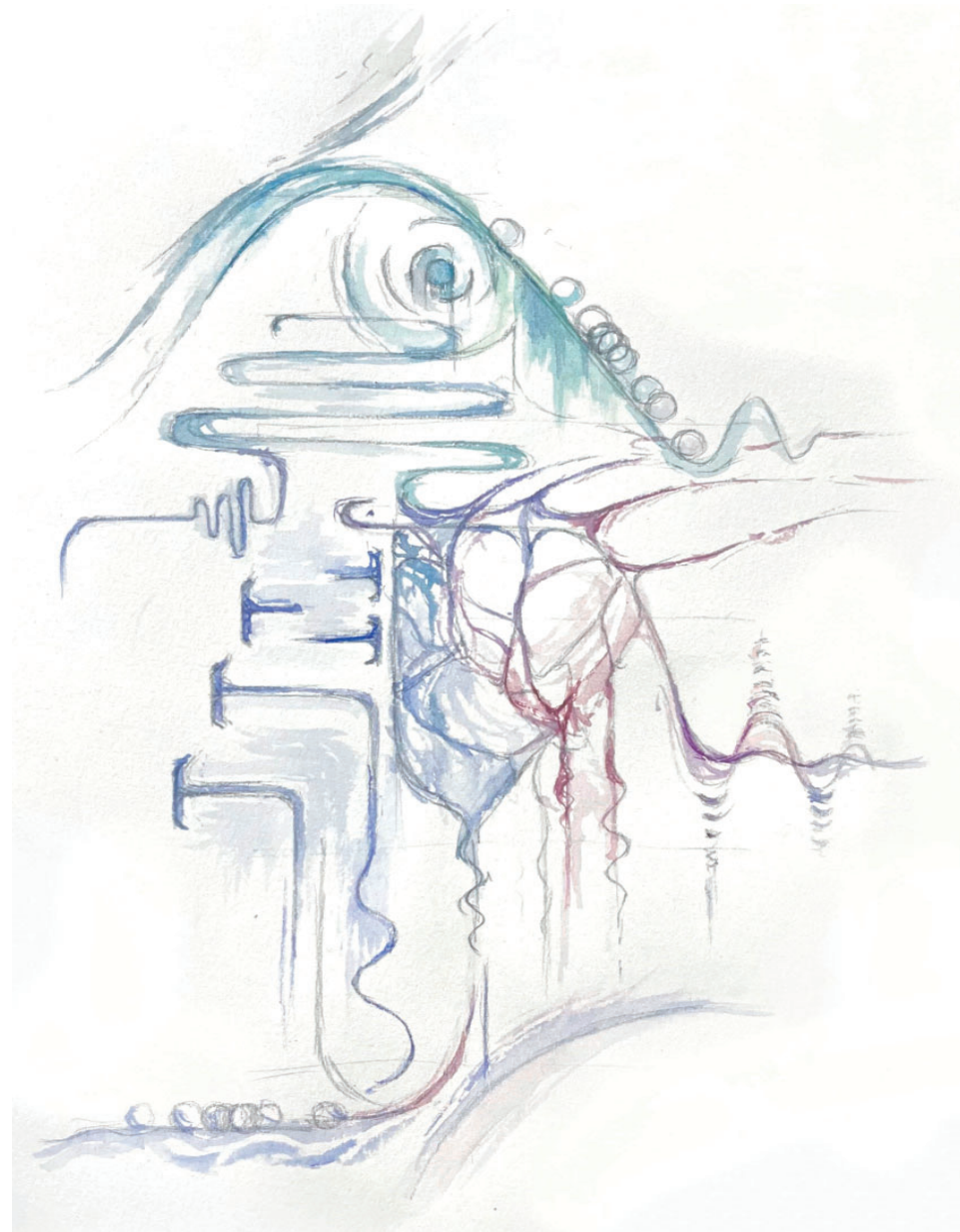


“Space is a social morphology: it is to experience what form itself is to the living organism, and just as intimately bound up with function and structure.”

- Henri Lefebvre.

Part 02

Invisible Manipulation



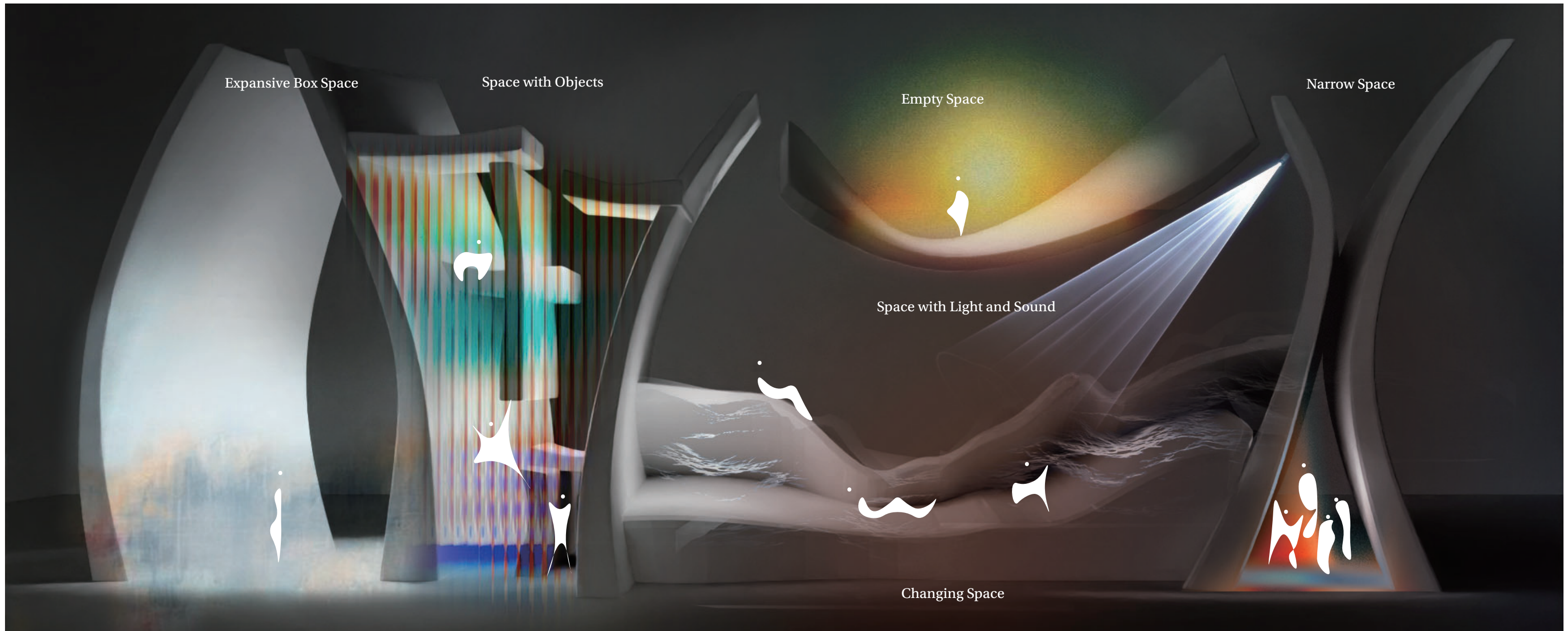
01 The Power of Background

Previously, we mentioned how space influences human behavior and identity. Here, we will explore the specific types and capabilities of space. In Edward Soja's Socio-Dialectic Theory, "An act where people and places are resultants of each other." [1] All spaces are continuously altered by human activities, which can influence a space's definition. "Static space" is defined as an area with clear and distinct functions, while the spaces connecting them are "dynamic spaces." Within dynamic spaces, the undefined parts are referred to as "threshold spaces," which denote a kind of intermediate, ambiguous state. [2]

In the Beijing subway, the primary static spaces include the entrance, the subway hall, and the subway platform directly below. The remaining corridors and escalators serve the function of rapid transit. Given that passengers desire to quickly reach the next static space while moving through these areas, these corridors and escalators can be viewed as elongated threshold spaces. This psychological anticipation combined with the actual length of these spaces intensifies the users' determination to pass through quickly, resulting in turbulent human flow and unavoidable congestion. When we assign specific functions to these ambiguously defined spaces, threshold spaces will be segmented into rhythmic static and dynamic spaces, creating new thresholds without conflicts between their length and psychological experience. This rhythmic alternation of spaces implies a variety of functions and behaviors, encouraging passengers to engage in diverse activities and focus on the spatial experience itself, thereby revitalizing their inner energy.

[1]SOJA, EDWARD W. "The Socio-Spatial Dialectic." *Annals of the Association of American Geographers* 70, no. 2 (June 1980): 207–25. <https://doi.org/10.1111/j.1467-8306.1980.tb01308.x>.

[2]Newcastle University. "The What's of Transition Spaces!!" *Urban Design Blog*, May 24, 2022. <https://nclurbandesign.org/transition-spaces/>.



In addition to abstract definitions, spaces are also categorized by their physical composition. The shape, color, sound, light, and atmosphere (temperature, humidity, etc.) of a space form a person's subjective perception of it. These elements are rich in psychological principles, and their effective combination can create a marvelous experience distinct from the real space itself. By using these elements to mimic specific environments, we can suggest stories occurring within the space, triggering behavior that may not align with reality.

For instance, in the case of "Sculptures of Dissipative Birds in the Wind," the digital simulation of birds' trajectories on screens allows observers to perceive the flight paths that only birds experience, creating a sense of blurred boundaries between themselves and the world. In Daniel Libeskind's design of the Jewish Museum in Berlin, the narrow and tall corridors convey a sense of chaos and loss, fostering empathy in visitors with historical tragedies. The linear space of subway station corridors provides a naturally good narrative environment, potentially serving as a theatrical stage. By modifying the elements of these spaces, we can create diverse stories and experiences.



02 Case Study

Phoenix Children's Hospital

Phoenix, Arizona, USA, HKS Architects, 2012

The design of our hospital is very creative. Different from the design of traditional hospitals, which are clean and tidy and use a lot of white materials, this hospital specially created an indoor environment for children that imitates the beauty of the surrounding mountains and natural desert. This focus begins the moment you enter the campus, where transparent colors, native plants and sculptures create a child-friendly healthcare environment. The three-story high-shade glass room takes into account both function and beauty, and transparently introduces natural light into the room.

Ferenc, Jeff. "Color full." Photograph. June 1, 2012. Accessed May 21, 2024.

Sculptures of Dissipative Birds in the Wind`

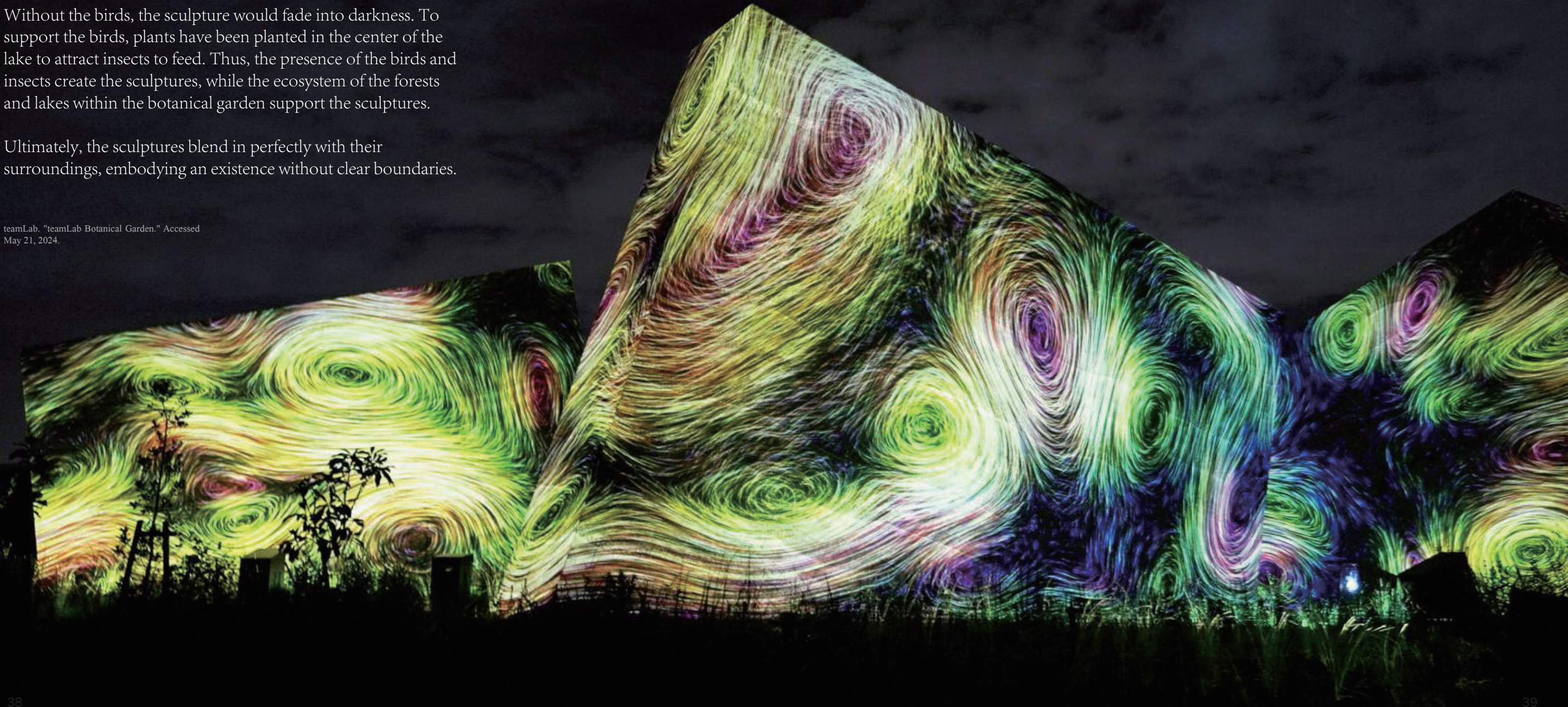
Osaka, teamLab, 2022

This artwork transcends physical boundaries and symbolizes the ongoing relationship between life and the environment. The giant sculpture depicts birds in flight dissipating energy and affecting the air, blending past and present moments.

Without the birds, the sculpture would fade into darkness. To support the birds, plants have been planted in the center of the lake to attract insects to feed. Thus, the presence of the birds and insects create the sculptures, while the ecosystem of the forests and lakes within the botanical garden support the sculptures.

Ultimately, the sculptures blend in perfectly with their surroundings, embodying an existence without clear boundaries.

teamLab. "teamLab Botanical Garden." Accessed May 21, 2024.





Jewish Museum, Berlin

Belin, Studio Libeskind, 1999

The Daniel Libeskind-designed Jewish Museum in Berlin is a contemporary example of immersive design. The building conveys history and emotion through its spatial elements, with rooms that evoke feelings of coldness, emptiness, absence and confusion. Tall, narrow rooms with slender skylights create a sense of closure, while sloping floors create a sense of instability and disorientation.

The interior is made of reinforced concrete, exacerbating the effect of vastness, emptiness, and dead ends, with only faint light filtering in. The design gives visitors a sense of the fear and despair that Jews felt during World War II. Even in the darkest moments, the faint light symbolizes hope.

Libeskind's immersive design transforms the museum into a powerful narrative tool that emotionally and psychologically engages visitors, providing them with a deep understanding of history and its impact, and fostering a greater appreciation for peace and human dignity.

Ghiniou, Laurian. "Daniel Libeskind's Jewish Museum Berlin." Photograph. Accessed May 21, 2024.



03 Psychology in the Elements

Color, sound, and light are key elements in shaping spatial experiences and influencing human perception. Color affects emotions and behaviors, altering our perception of space size and comfort[1]. Sound, especially music, regulates our cognitive and perceptual processes by influencing our emotional states and perception of time[2]. Light also plays a powerful role, not only affecting visual perception but also adjusting our biological clocks by mimicking natural light rhythms, thereby impacting our sleep patterns and overall well-being[3]. These components are vital in environment design, where their application can enormously improve the usefulness and tastefulness of space while optimizing the living and working situations for individuals.

The image on the left outlines my concept box, in which I have carefully divided six specific levels. Each layer has gaps through which small balls travel, recreating the encounters explored in the subway frame. The design is intended to mimic the changes experienced in travel on the subway system. Each layer offers a unique combination of colors, shapes, routes, sounds, and materials that turn a routine of clear and repetitive travel into a colorful enterprise. By covering these layers, the concept box captures the dynamism and multifaceted nature of urban commuting, making it a lock-in and vibrant encounter for customers.

[1] BOESCHENSTEIN, WARREN. "EXPRESSIVE URBAN COLOR." *Journal of Architectural and Planning Research* 3, no. 4 (1986): 275–85. <http://www.jstor.org/stable/43028817>.

[2] Schäfer, Thomas, Jörg Fachner, and Michael Smukalla. "Changes in the Representation of Space and Time While Listening to Music." *Frontiers in Psychology* 4 (August 6, 2013): 508. <https://doi.org/10.3389/fpsyg.2013.00508>.

[3] Souza, Eduardo. "Young Architects Innovate for Better Sleep in Space and (Hopefully) on Earth." *ArchDaily*, April 6, 2023. https://www.archdaily.com/998905/young-architects-innovate-for-better-sleep-in-space-and-hopefully-on-earth?ad_campaign=special-tag.

Past inquiries have appeared that color significantly impacts brain research, fortifying feelings, directing behavior, and indeed impacting decision-making forms. Colors can alter spatial recognition in natural design, making spaces feel bigger or more compact. Additionally, the social noteworthiness of color changes with distinctive social foundations allotting shifted implications and sentiments to the same color[1]. For case, ruddy may symbolize success in a few societies and peril in others. Color expression in materials and surfaces is significant as distinctive materials and surfaces can change color recognition and material impacts, in this manner affecting feelings and behaviors[1].

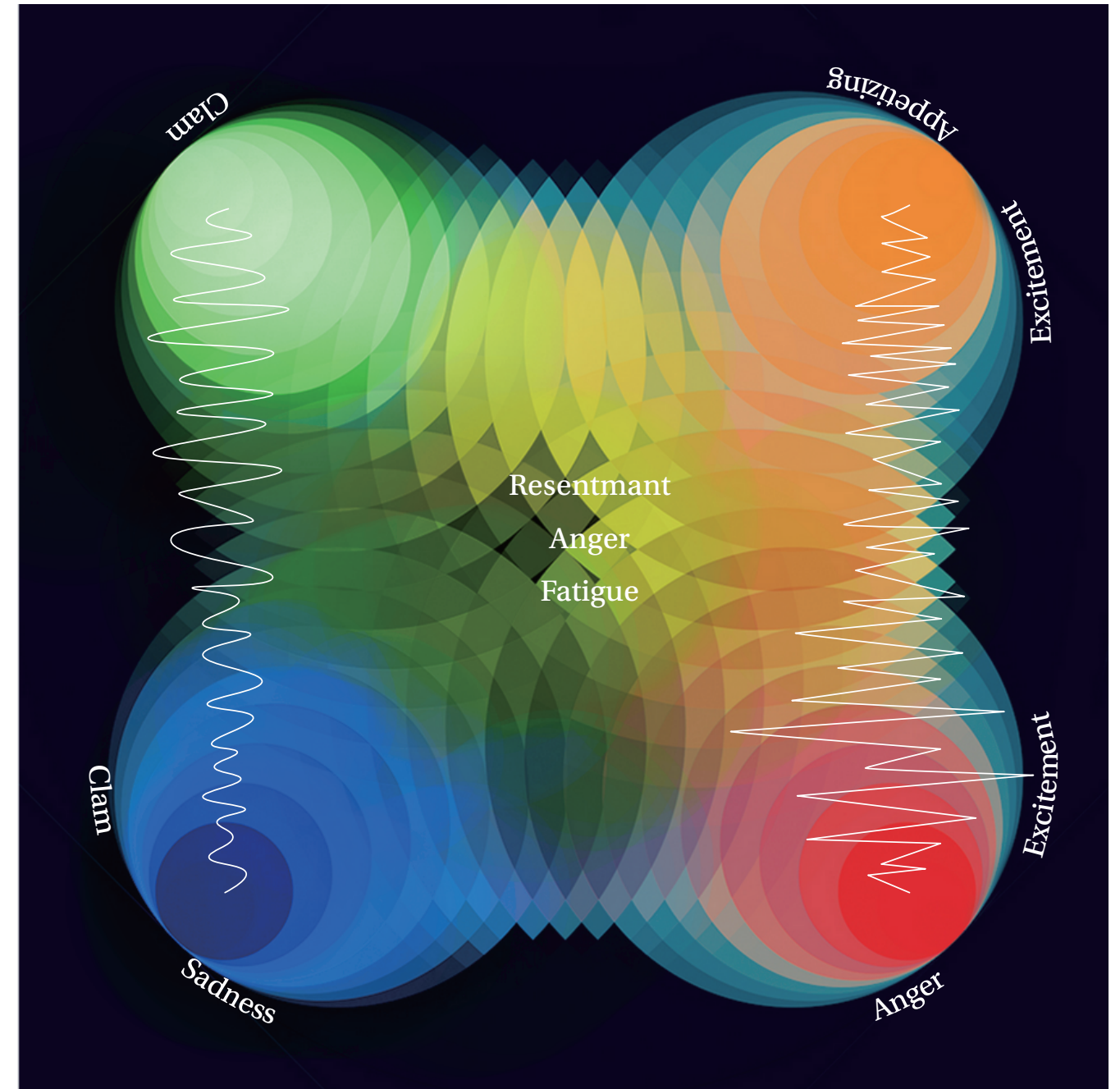
On a psychological and physiological level, the effects of color are comprehensive and complex. Color can stimulate emotions, affect heart rate and blood pressure, and change spatial estimation and temperature discrimination. [2 In daily life, most designers have a relatively general understanding of the use of color, such as red and orange, and other warm colors are generally used to inspire vitality, in order to enhance thinking ability and enthusiasm for work. It is also a very appetizing color, suitable for use in a dining environment.

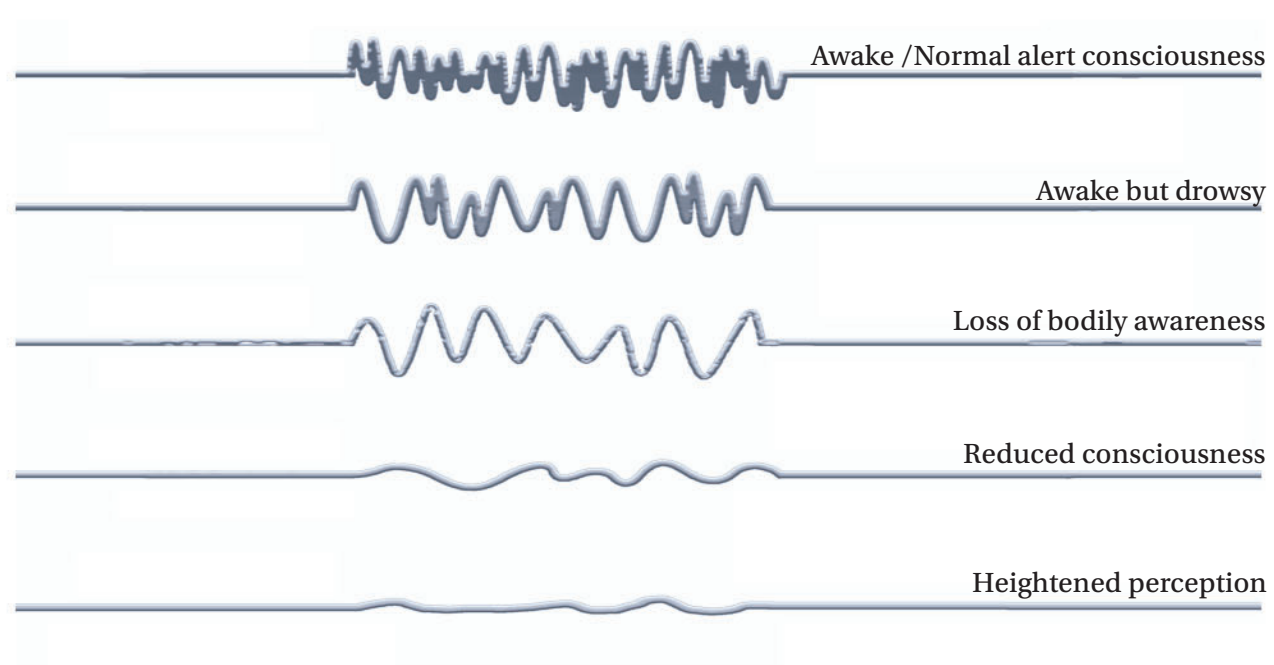
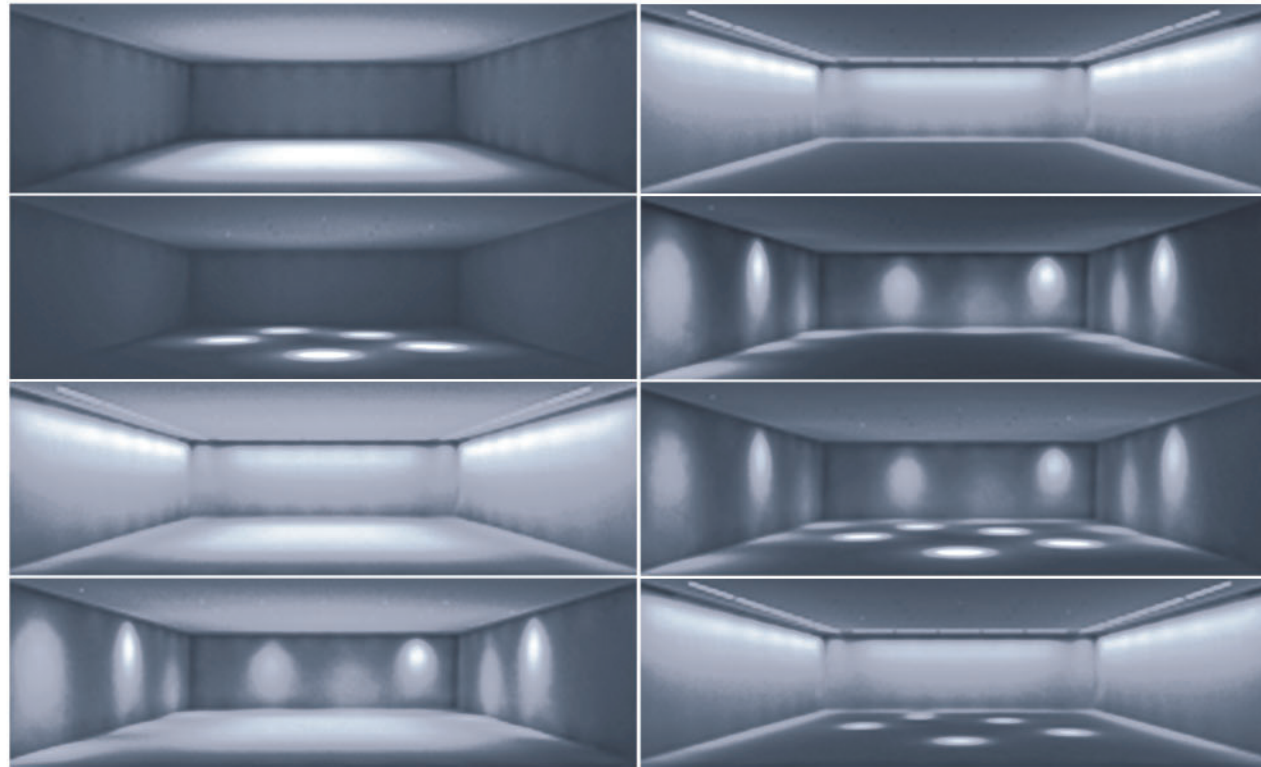
Blue and green are used in environments that require calm and relaxation, are suitable for use in high-stress situations, and can reduce heart rate and blood pressure. In most contexts, yellow is a warm, eye-grabbing color, but in fact its high reflectivity can cause visual fatigue, as well as a degree of jealousy and irritability [3]. When designing, we should not follow the cognition of color under cultural background but should combine actual scientific theories to design color and avoid potential negative reactions.

[1] BOESCHENSTEIN, WARREN. "EXPRESSIVE URBAN COLOR." *Journal of Architectural and Planning Research* 3, no. 4 (1986): 275–85. <http://www.jstor.org/stable/43028817>.

[2] Waurich, Mark. "Light and Colour in Therapeutic Space." *PULSE ARCHITECTURE*, July 27, 2021. <https://www.pulsepl.com/blogs/light-and-colour-in-therapeutic-space>.

[3] Swan, Lydia. "The Power of Color in Transit." *Mass Transit*, April 21, 2014. <https://www.masstransitmag.com/home/article/11269627/the-power-of-color-in-transit>.





Another huge influence on human perception and discrimination is lighting. Studies have shown that different types, colors, and ways of lighting can greatly change our mental state and perception of space [1]. Uniform, streamlined lighting on the vertical surface of the ceiling will generally improve the sense of space and make people think that the space is larger. Uneven, streamlined lighting is more relaxing and protective because of reduced illumination and the use of more warm colors. [1]

Another study of light in the lives of space travelers shows that lighting significantly affects human biorhythms. Poor lighting often leads to poor execution, resulting in inattention and mistakes at work. The solution is to arrange different wavelengths of light at different times to mimic the light in nature [2].

Outside of visual perspective, music and sound often cannot be described by concrete standards. Studies have shown that sound in the environment has a great impact on people's emotions and cognition [3]. Research by Schafer, Fachner, and Smukalla points out that, contrary to the traditional theory that time and space are constant, music changes the brain's perception of time, lengthening or shrinking our sense of time, which can lead to a "left" or "right" shift in time estimation, causing people to underestimate or overestimate the length of time [3]. Harnessing this property of sound can reshape our travels, channeling different emotions and experiences.

[1] Grant, Meg. "The Psychology behind Architectural Lighting!" Sarah Richter Design, October 26, 2022. <https://www.sarahrichterdesign.com/blog/the-psychology-behind-architectural-lighting>.

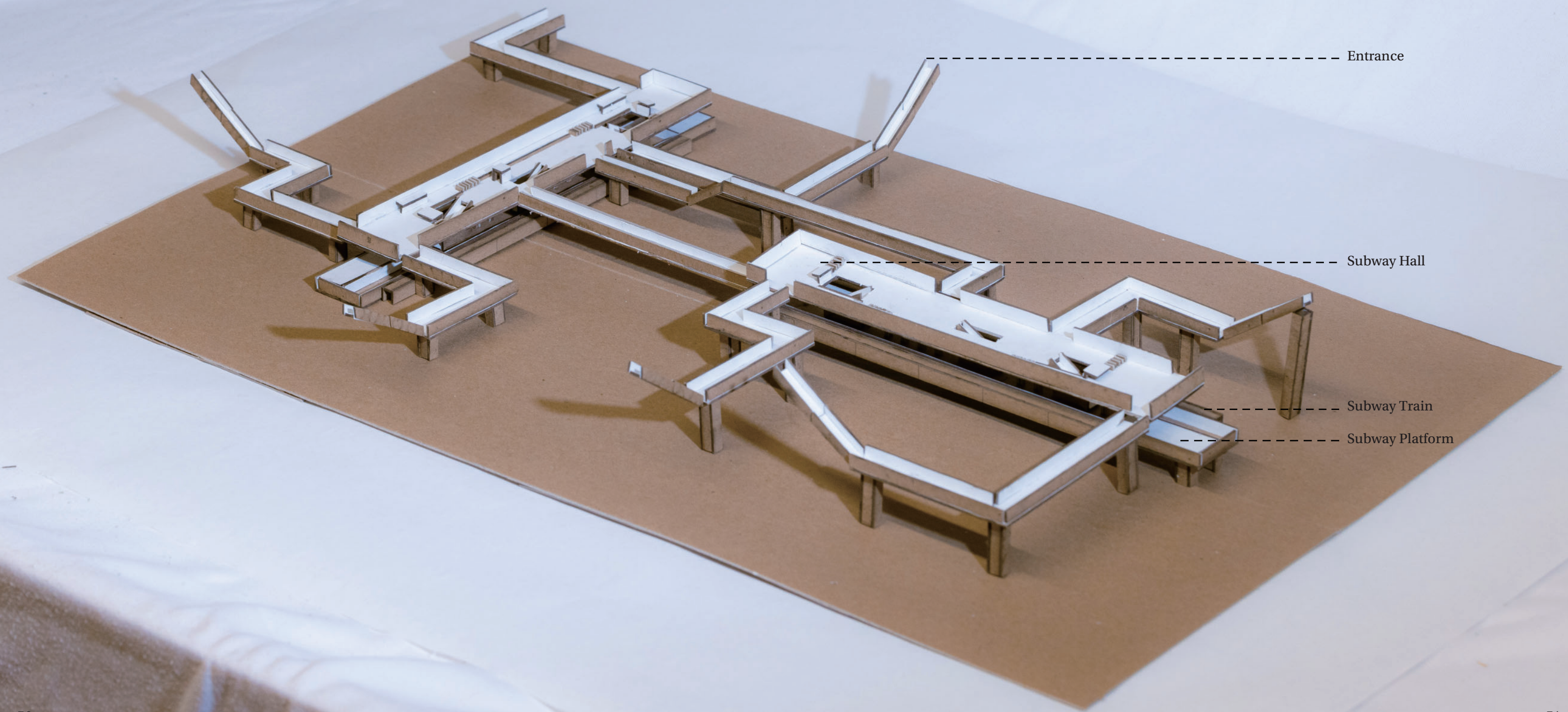
[2] Souza, Eduardo. "Young Architects Innovate for Better Sleep in Space and (Hopefully) on Earth." ArchDaily, April 6, 2023. https://www.archdaily.com/998905/young-architects-innovate-for-better-sleep-in-space-and-hopefully-on-earth?ad_campaign=special-tag.

[3] Schäfer, Thomas, Jörg Fachner, and Michael Smukalla. "Changes in the Representation of Space and Time While Listening to Music." *Frontiers in Psychology* 4 (August 6, 2013): 508.



Part 03

Design Methods



----- Entrance

----- Subway Hall

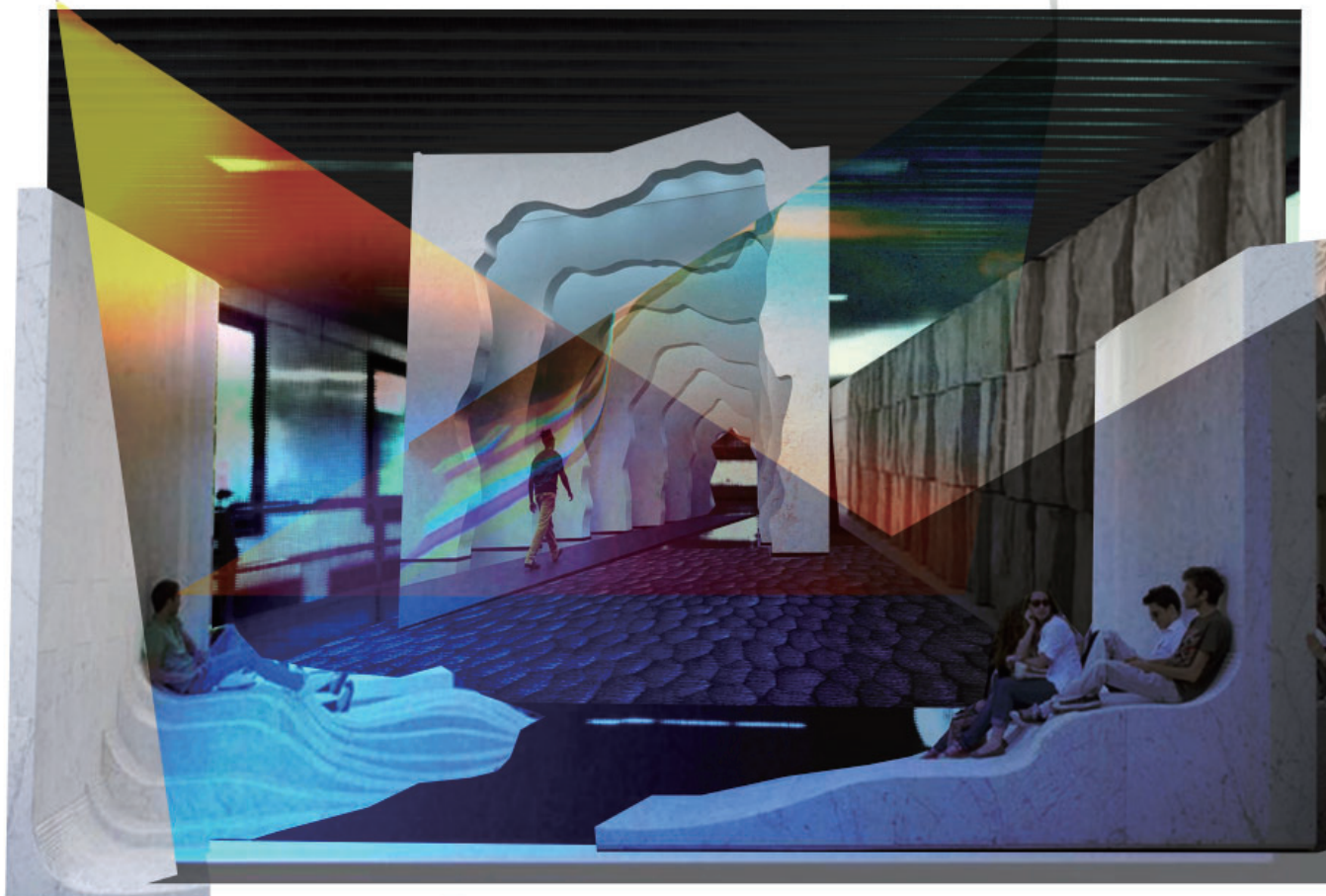
----- Subway Train

----- Subway Platform

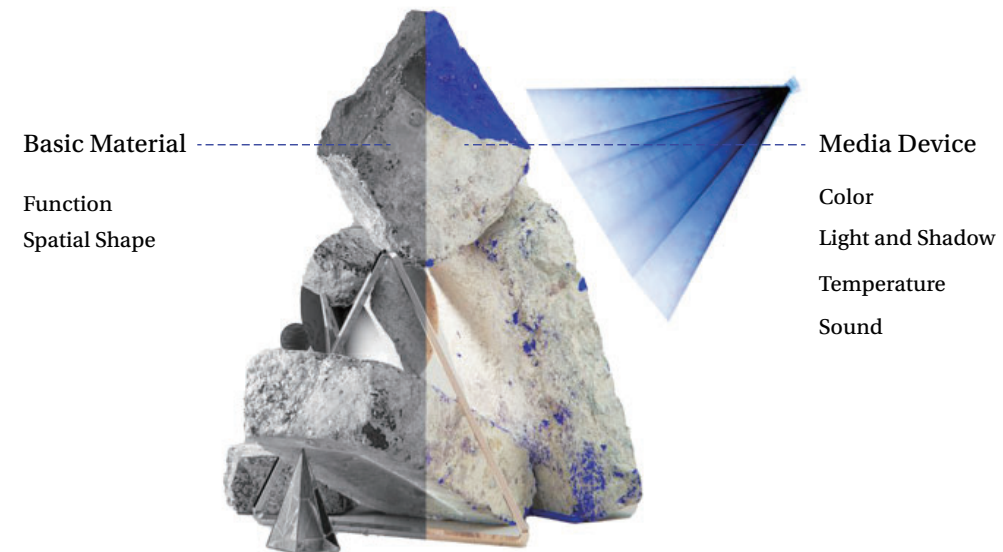


Spatial + Media

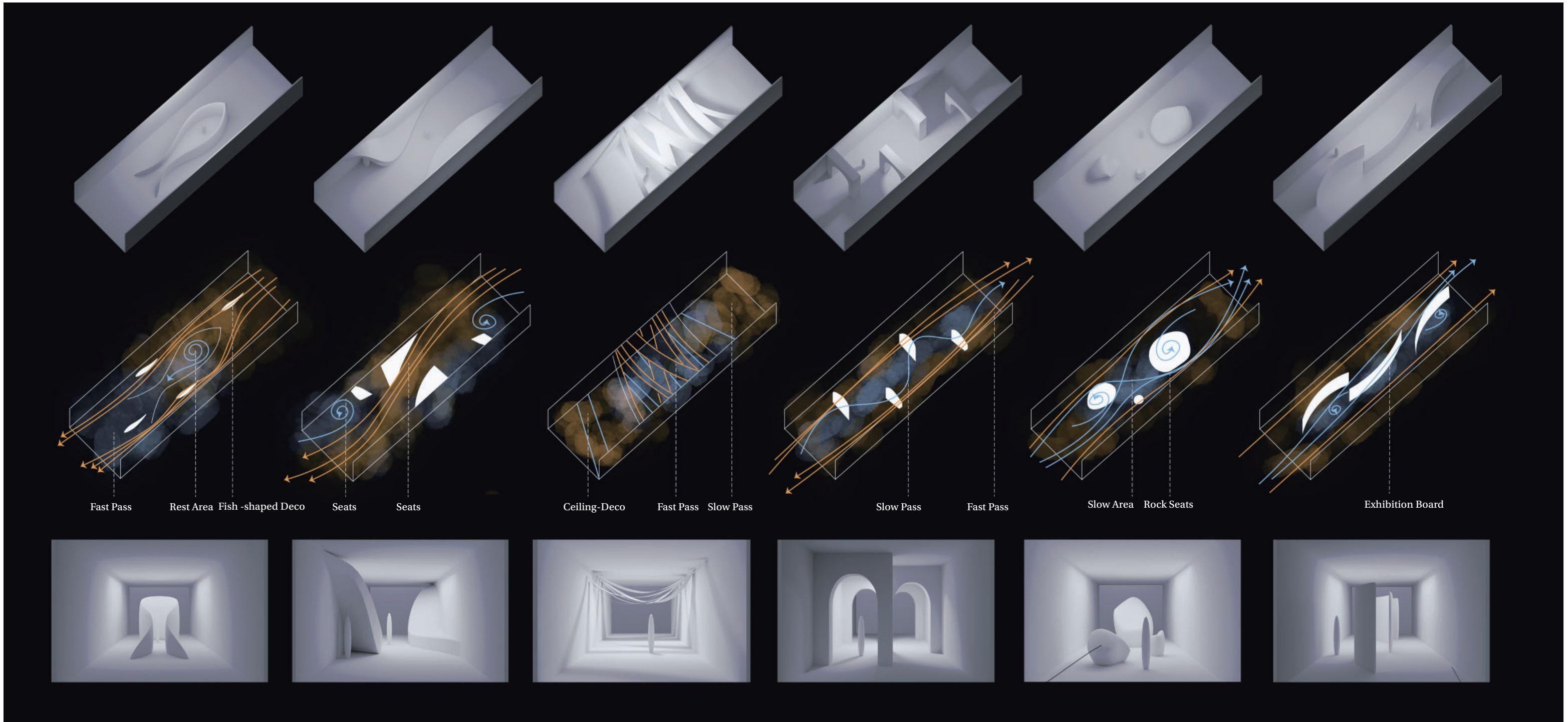
After observation and analysis, I believe that in the dynamic environment of Beijing subway stations, the parts that have the greatest impact on the journey are the corridors, corners and elevators. So I isolated these three Spaces for modular design. By changing the shape and combination of elements in these areas, the invisible narrative of the scene is changed, ultimately creating richer behavioral possibilities for passengers. This design hopes to provide easy modification and innovative ways of reshaping the space without changing the structure of the building and encourage diverse interactions and experiences between passengers.



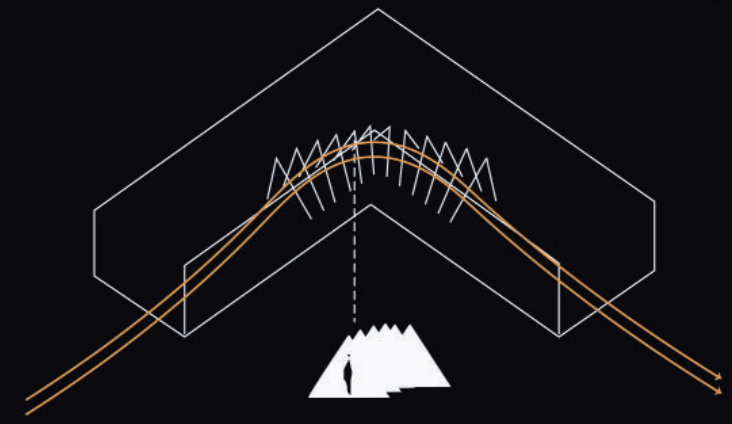
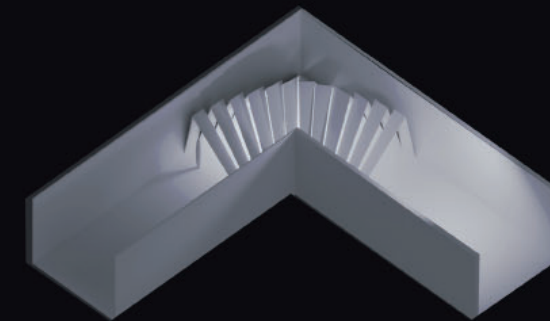
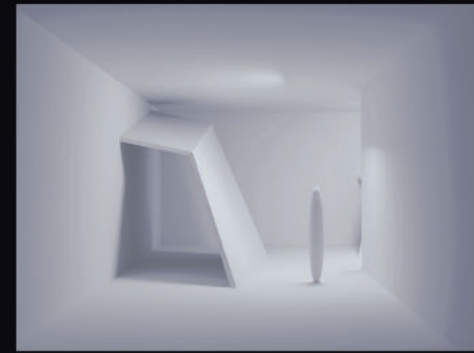
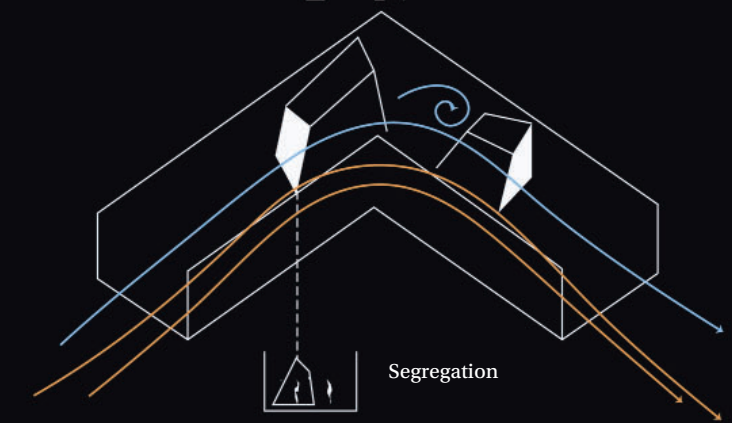
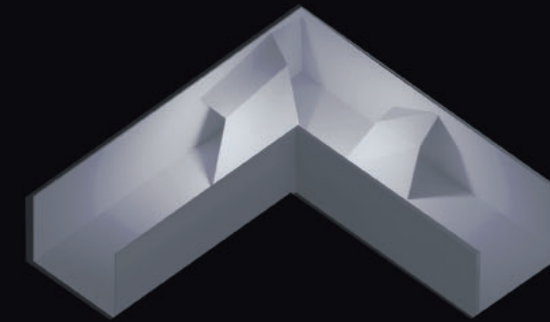
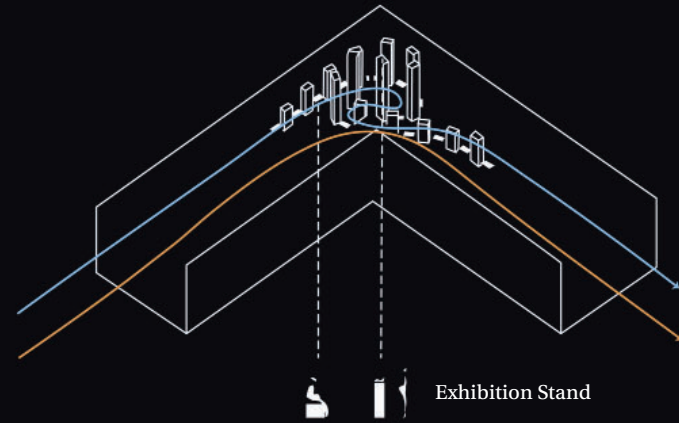
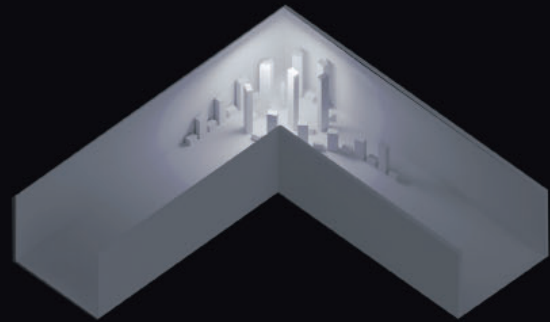
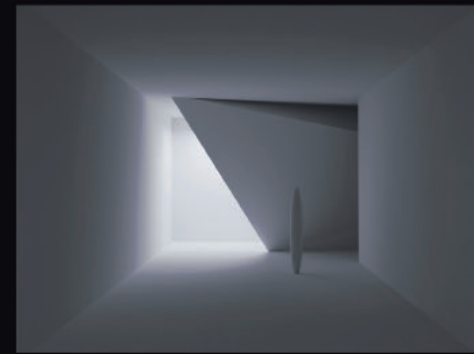
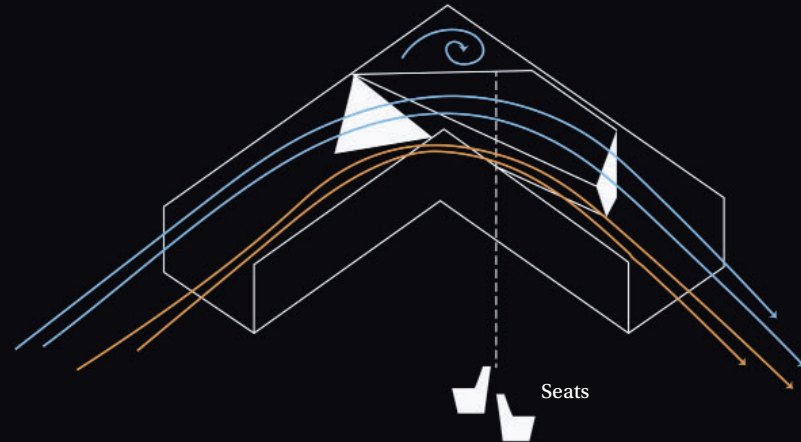
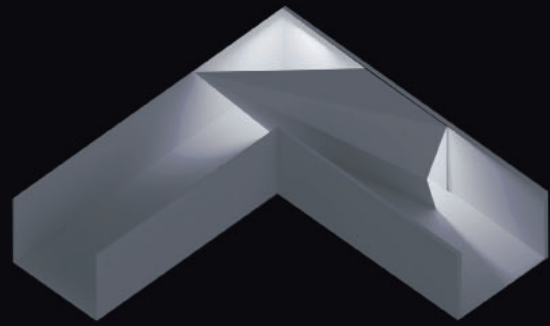
Spatial + Media



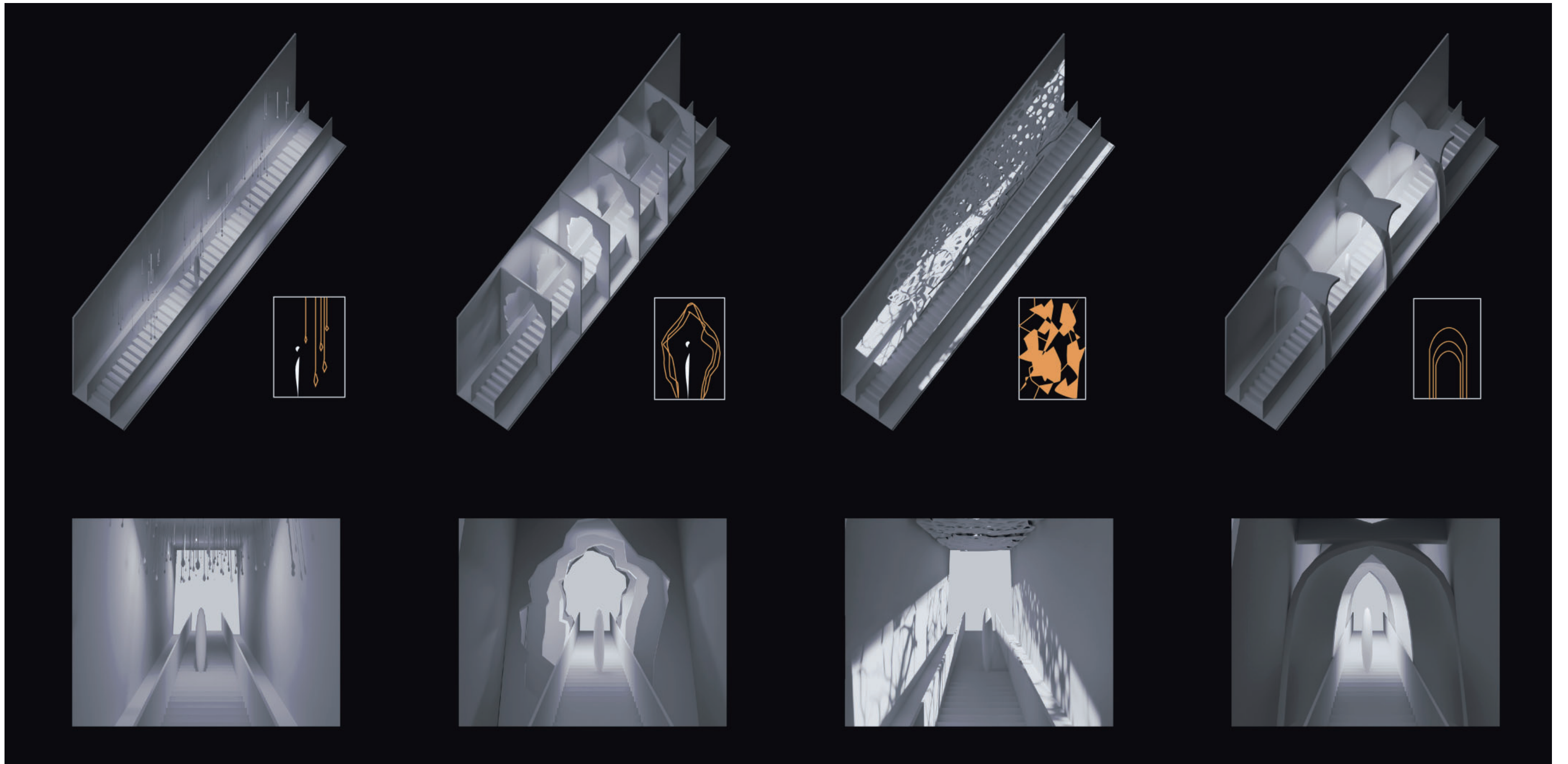
In addition to the basic shape and material changes of the space, I used the method of adding media to project different colors, lights, and sounds to the space. This approach is flexible and can be linked to the outside city, putting sensory stimulation first and pulling people into a virtual experience that is not part of the real space.



These are six ways to design a corridor. By mimicking the impact of stones in the flow of water, I sought to create resting spaces that could be stopped and viewed briefly. I also separated the fast crowd from the slow crowd so that everyone could choose whether to take a short break or leave immediately. The design on the ceiling adds rhythm to the corridor and can change one's perception of time.



This is a partial example of corner design. In the design, my goal was to reduce the impact of the 90-degree corner on the flow of people and to use the existing gray space to create a slow-speed area. I used a rounded design to soften the moving lines, split the triangular area at the top, and use this part as a rest or exhibition space.



In the design of escalators, the unique feature that does not require the physical effort of the user provides them with a rare respite. In order to maximize the use of this time, I used exaggerated spatial segmentation techniques and projection content, hoping to make people feel that they have entered a new area when riding the escalator up or down.

The projection is connected to a ground-based camera to capture beautiful moments in the city, such as weather changes, animal presence, and plant growth. These projectors will also display computer-generated images, including scenes such as fantasy, oceans, and glaciers. This combination of real and virtual visuals is designed to create a dynamic, immersive experience that blends the natural world with an imagined landscape.



Plants

Animals

Weather

City Story

Sound



The gloss and texture of materials affect color perception.

01 Rough Surface Materials (Cement, Stone)

02 Smooth surface material (Plastic, Concrete, Wood)

03 Transparent materials (Glass, Acrylic, Resin)

04 Translucent material (PS,PC,ABS)

05 Porous materials (Metal mesh, Woven fabrics)

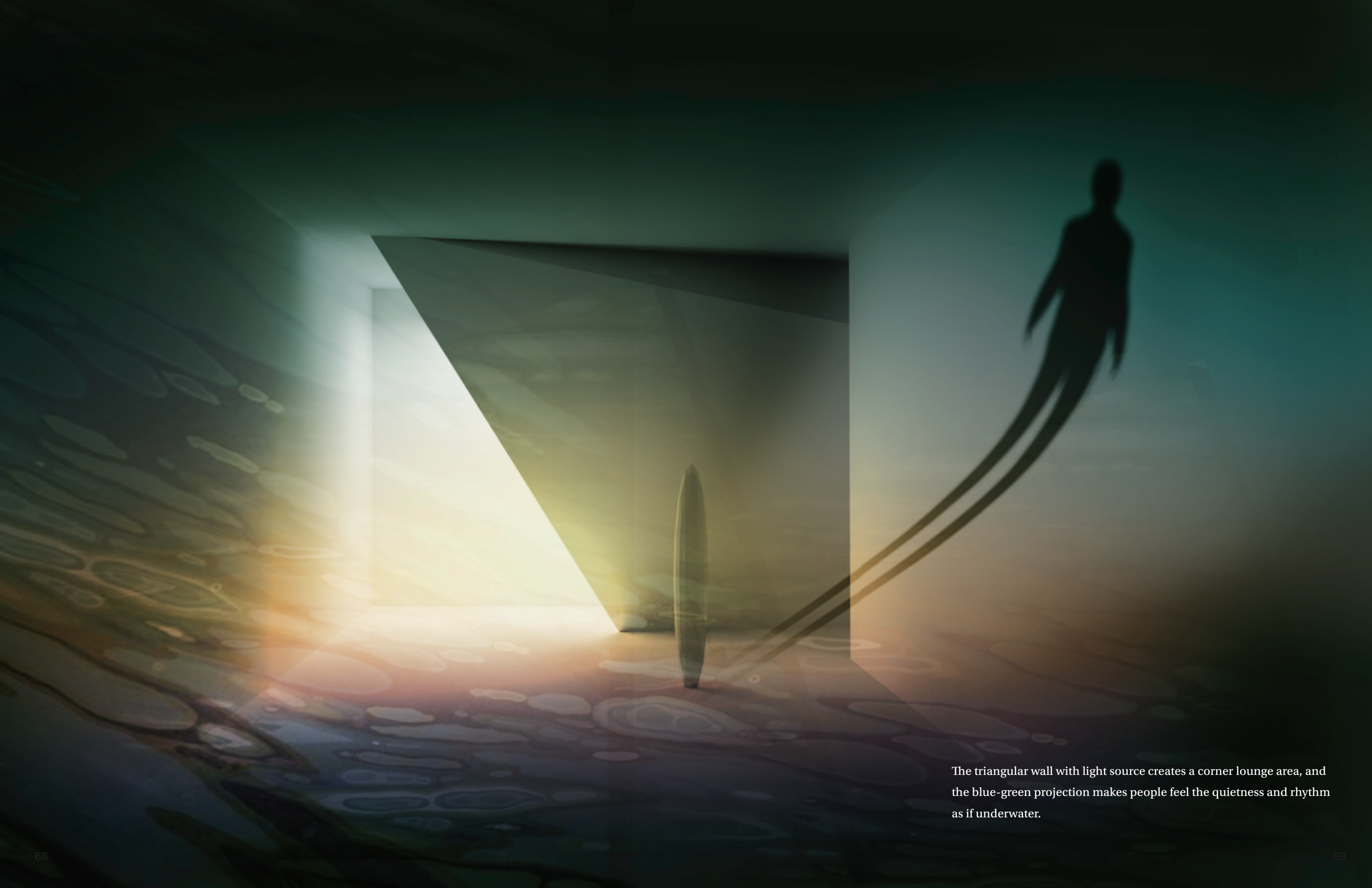
06 Reflective materials (Mirrors, Stainless steel)

07 Organic Biomaterials (Mycelium)

06 Composite materials

Repeated arches give the promenade a different rhythm and the projection of the setting sun creates a warm atmosphere.





The triangular wall with light source creates a corner lounge area, and the blue-green projection makes people feel the quietness and rhythm as if underwater.



The overlapping walls around the elevator create the effect of a cavern, where pedestrians can stand still and enjoy a rare break and a wonderful visual experience.



Conclusion

In this thesis, I focus on how to re-imagine the existing indoor environment of the subway in Beijing, with the intention of transforming the repetitive and heavy commuting experience into a more interesting and meaningful urban journey, so as to change people's inner perception of the city and attitude towards life. By studying the influence of space shape, sound, color and light on people's mood and behavior, I reshape the criteria of subway design, so as to add a more humane thinking Angle for future subway design.

Specific research results show that space shape does influence the actions and choices people make, while color can influence physiological conditions, emotions, and estimation of space. Sound affects how long people perceive time. Light affects people's estimation of space size and circadian rhythms. These elements combine to create a rich, experiential commuting environment that meets people's inner needs.

These findings have important common-sense recommendations for city organizers, designers, and policymakers. By integrating color, sound, and light into subway system design, it promotes physical and mental health, increases customer engagement, and enhances well-being. This exploration contributes to a broader discussion of urban design and open transportation, driving a shift from those that consider simple and practical designs to those that consider the spiritual and inner needs of the client.

However, due to the availability of structural data and the extent to which the existing structure of the Beijing subway can be modified, this paper also has many limitations, including that the final design does not break through the original subway space shape. Future research should further explore the retrofit of Spaces from a construction perspective and the long-term impact of these designs on commuters' well-being.

In conclusion, reimagining the subway environment offers a special opportunity to enrich urban life. By turning the daily commute into an uplifting encounter, we will foster a deeper connection between people and the urban environment.

Bibliography

Bourdieu, Pierre, Richard Nice, and Tony Bennett. *Distinction: A social critique of the judgement of taste*. London: Routledge, Taylor & Francis Group, 2015.

BOESCHENSTEIN, WARREN. "EXPRESSIVE URBAN COLOR." *Journal of Architectural and Planning Research* 3, no. 4 (1986): 275–85. <http://www.jstor.org/stable/43028817>.

Cunning, David. "Agency and Consciousness." *Synthese* 120, no. 2 (1999): 271–94. <http://www.jstor.org/stable/20118202>.

Christopher, Prof Martin. *Logistics and Supply Chain Management*. United Kingdom: Pearson Education Limited, 2012.

Daganzo, Carlos. *Logistics Systems Analysis: With 4 tables*. Berlin: Springer, 2005.

Grant, Meg. "The Psychology behind Architectural Lighting!" *Sarah Richter Design*, October 26, 2022. <https://www.sarahrichterdesign.com/blog/the-psychology-behind-architectural-lighting>.

Jiang, Haibing, and David Levinson. "Accessibility and the Evaluation of Investments on the Beijing Subway." *Journal of Transport and Land Use* 10, no. 1 (2017): 395–408. <http://www.jstor.org/stable/26211737>.

London Transport Museum. "Charles Holden: London Transport's Architect." October 1, 2020. Accessed March 15, 2024. <https://www.ltmuseum.co.uk/collections/stories/people/charles-holden-london-transport-architect>.

Milrose Consultants. "Subway Art & Architecture." *Milrose Family of Companies*, November 12, 2018. Accessed March 15, 2024. <https://www.milrose.com/insights/subway-art-architecture>.

Milrose Consultants. "The Surprising History of Graffiti on NYC Subways Cars and Tunnels." *Milrose Family of Companies*, May 29, 2018. Accessed March 15, 2024. <https://www.milrose.com/insights/the-surprising-history-of-graffiti-on-nyc-subways-cars-and-tunnels>.

Martin, Rory, and Stephen Choi. "Biophilic Design: An Introduction for Designers." *Environment Design Guide*, 2018, 1–15. <https://www.jstor.org/stable/26496280>.

Newcastle University. "The What's of Transition Spaces!!" *Urban Design Blog*, May 24, 2022. <https://nclurbandesign.org/transition-spaces/>.

Olsson, Lars E., Tommy Gärling, Dick Ettema, Margareta Friman, and

Satoshi Fujii. "Happiness and Satisfaction with Work Commute." *Social Indicators Research* 111, no. 1 (2013): 255–63. <http://www.jstor.org/stable/24719141>.

Qianggen. "Inventory of the History of the Beijing Subway." September 26, 2015. Accessed March 15, 2024. <https://culture.qianggen.net/2015/0926/46190.html>.

Prasertsuk, Santirak. "Story of Post-Modernism: Five Decades of the Ironic, Iconic and Critical in Architecture." *Journal of Architectural Planning Research and Studies (JARS)* 11, no. 1 (October 30, 2014): 137–40. <https://doi.org/10.56261/jars.v11i1.23884>.

SOJA, EDWARD W. "The Socio-Spatial Dialectic." *Annals of the Association of American Geographers* 70, no. 2 (June 1980): 207–25. <https://doi.org/10.1111/j.1467-8306.1980.tb01308.x>.

Schäfer, Thomas, Jörg Fachner, and Michael Smukalla. "Changes in the Representation of Space and Time While Listening to Music." *Frontiers in Psychology* 4 (August 6, 2013): 508. <https://doi.org/10.3389/fpsyg.2013.00508>.

Souza, Eduardo. "Young Architects Innovate for Better Sleep in Space and (Hopefully) on Earth." *ArchDaily*, April 6, 2023. https://www.archdaily.com/998905/young-architects-innovate-for-better-sleep-in-space-and-hopefully-on-earth?ad_campaign=special-tag.

Swan, Lydia. "The Power of Color in Transit." *Mass Transit*, April 21, 2014. <https://www.masstransitmag.com/home/article/11269627/the-power-of-color-in-transit>.

Venturi, Robert, and Vincent Scully. *Complexity and contradiction in architecture*. New York: The Museum of Modern Art, 2019.

Vandevyvere, Han, and Hilde Heynen. "Sustainable Development, Architecture and Modernism: Aspects of an Ongoing Controversy." *Arts* 3, no. 4 (October 14, 2014): 350–66. <https://doi.org/10.3390/arts3040350>.

Waurich, Mark. "Light and Colour in Therapeutic Space." *PULSE ARCHITECTURE*, July 27, 2021. <https://www.pulsepl.com/blogs/light-and-colour-in-therapeutic-space>.

Wener, Richard E., Gary W. Evans, Donald Phillips, and Natasha Nandler. *Transportation* 30, no. 2 (2003): 203–20. <https://doi.org/10.1023/a:1022516221808>.

Figures

"City Hall Subway Station." *Ephemeral New York*. Accessed May 21, 2024. <https://ephemeralnewyork.wordpress.com/tag/city-hall-subway-station/>.

Demery, L.W. Photograph. Flickr. Accessed May 21, 2024. <https://www.flickr.com/photos/lwdemery/5024984579>.

Ferenc, Jeff. "Color full." Photograph. June 1, 2012. Accessed May 21, 2024. <https://www.hfmmagazine.com/articles/147-color-full>.

GaoDe Map. "Beijing Subway 13 Line." Photograph. JCDecaux. Accessed May 21, 2024. <https://www.jcdecaux.com.cn/bei-jing-di-tie>

Ghinitoiu, Laurian. "Daniel Libeskind's Jewish Museum Berlin." Photograph. Accessed May 21, 2024. <https://www.archdaily.com/photographer/laurian-ghinitoiu>.

Hackemann, Jorg. "Subway tile in the New York subway today." Photograph. Accessed May 21, 2024.

"Trial-Trip on the Metropolitan (Underground) Railway: The Train Passing the Portland-Road Station." Wood engraving. 1862. Wellcome Collection. Accessed May 21, 2024. <https://www.europeana.eu/en/item/9200579/y9dtbna4>.

teamLab. "teamLab Botanical Garden." Accessed May 21, 2024. <https://www.teamlab.art/e/botanicalgarden/>.

Wikimedia Commons. "Thames Tunnel Train." Photograph. Last modified March 28, 2007. Accessed May 21, 2024. https://commons.wikimedia.org/wiki/File:Thames_tunnel_train.jpg.

