The Spectrum of Accessible Architectures
Designing for Neurodivergence

By

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Abstract

In the field of architecture, "accessibility" all too often addresses only "physical accessibility." Consequently, the sensory barriers facing neurodivergent individuals as they navigate the built environment beg to be considered and addressed. This thesis embraces truly inclusive accessibility via an exploration of sensory perception and its relationship to architectural experience. From this exploration there emerges a neuro-inclusive design methodology that promises to close the gap between the built environment and sensory impairment. The use of the term "spectrum" refers to the span extending from hyper- to hypo-sensitivity and encapsulates the diversity of sensory ability experienced by the neurodivergent population. As an architectural approach, the spectrum construct is well-suited to welcoming flexibility and adaptations and holds promise in inclusive architectural design. To showcase the potential of a "spectrum design" methodology in a real-world context, this thesis concludes in an architectural proposal for a neuro-inclusive student centre on Carleton University's Campus.

figure 1. Sensory Architecture

Acknowledgments

Thes completion of this work owes its realization to the generous contributions of the many individuals who devoted their time and support throughout my academic journey.

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Finally, this work would not be possible without my greatest cheerleader, my sister Brigid, to whom this thesis is dedicated. Witnessing the immeasurable light you bring to this world is an extraordinary gift.

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Prologue

On June 22, 2022, I graduated from Carleton University's Bachelor of Architecture program. Throughout the events of that excessively hot afternoon, my youngest sister was at my side. Inside the architecture building's three-story open atrium, the growing crowd, echoes of chatter, shouts overhead, and flashes of cameras mixed into a sticky, hazy, and intense sensory environment. As I navigated through the crowd, my own ease in the adrenaline filled environment was confronted by the lack of ease in the one whose small hand was tightly gripping my own. My own familiarity with the building had disregarded her lack thereof, a mistake I attempted to resolve by guiding her to an area in the building which could provide some refuge from the chaos. My youngest sister has Down Syndrome and a unilateral hearing impairment which impacts – among other things –her balance and auditory processing. As we moved up the stairs attempting to get away from the overwhelming crowd, I began to recognize the many barriers the building presented to her. The floating concrete stairs were visually confusing, and the thin metal railing on one side provided little reassurance. Moving up the stairs one at a time, the noise of the crowd made it intensely difficult for her to comprehend her spatial environment. The open bridge at the top of the staircase lacked the refuge that a solid wall could provide her. At the top of the next set of stairs, we moved away from the opening to the atrium below. I searched for a more intimate space – somewhere the walls connected to the ceiling and the floor, somewhere away from the loud crowd whose noise still reached us two stories away.

This memory emerged distinctly when I began to consider my thesis topic. It remains prominent in my memory today as an example of the way in which the built environment, for all its grandeur, fails to accommodate the diverse needs of its inhabitants. Throughout my six years studying architecture, I have continually noticed the lack of attention shown to issues of accessibility; they are typically lower in priority than topics like sustainability, new technology or economics. Growing up alongside someone with disabilities has provided me with a window into a world in which an everyday encounter with the built environment can present immense challenges.

"Like a canary in a coal mine alerted miners in a bygone age, the neurological experiences of people with accentuated neurological experiences teach us to pay attention to the stressful aspects of environments around us – to the benefit of us all."

Designing Mind-Friendly Environments: Architecture and Design for Everyone.
Steve Maslin. 2021.

figure 2. Prologue

Introduction

Accessibility is a foundational principle in contemporary architecture that strives to ensure the design and construction of buildings, spaces and environments are inclusive and usable by all individuals. Generally, accessibility discourse is ocular-centric and emphasizes visible physical disability. Invisible disabilities, in particular, neurological ones, are largely absent from disability discourse. Accessibility issues arising due to disabilities we see – such as physical impairments- are far easier to understand and solve. In turn, disabilities that are not externally visible, and the accessibility issues they create, are readily ignored. The result is a binary understanding of accessibility in which "a person can either walk up the stairs or cannot; there is no space in between."[1] This is an oversimplification. While the provision of an elevator or ramp completely solves the physical accessibility of an individual in a wheelchair (who cannot walk up the stairs), it does not solve the wider question of accessibility. Indeed, in cases where individuals suffer from invisible disabilities affecting, for example, their balance, a solid handrail will also be very useful. Accessibility is not black and white, but rather, unfolds along a spectrum.

In the pursuit of truly inclusive accessibility, this thesis explores the concept of neurodivergence and its much wider spectrum of disabilities. The following exploration of architectures of disability begins by acknowledging fundamental oversights pertaining to neurodivergence and sensorial experience. The existing binary understanding of accessibility neglects a significant portion of the population. This myopic perspective limits a broader understanding of inclusivity within the built environment.

Building on this critique, the thesis introduces the concept of a "spectrum" to encapsulate the diverse manifestations of neurodivergence. The term "spectrum" is suggestive of classification in terms of a position on a scale between two extreme or opposite points. The term is often used in discussions about neurodivergence. Notably, the condition once known as "autism" is now technically titled "autism spectrum disorder" or "ASD," and describes "a clinically heterogeneous group of neurodevelopmental disorders that share common behavioral core features..."[2] The use of the word spectrum encompasses the wide diversity of forms in which the condition may appear and will therefore be useful in this thesis.

Non-visible disabilities exist in a variety of forms: neurological, cognitive, and neurodevelopmental. Neurodivergent individuals are those whose cognitive profile differs significantly from the dominant norm.[3] This category includes a wide variety of neurological conditions but common among these varying neurotypes are the sensory processing challenges they face. It is important to underscore that within a neurodivergent population, sensory sensitivities differ for every individual. As outlined in the recent British standards guide, *Design for the Mind - Neurodiversity and the Built Environment*, "Someone might experience atypically high response to a sensory stimulus (hypersensitive) or atypically low response (hyposensitive)."[4] What may feel like an assault of sensory stimuli to one person may feel dull or go unnoticed by another. Sensory sensitivity occurs along the "hyposensitivity" to "hypersensitivity" spectrum, where the former refers to an increased response to environmental stimuli while latter refers to a reduced response. To be sure, due to this spectral variety, designing for neurodiversity poses tremendous challenges. This thesis faces them and proposes speculative design avenues.

In Chapter 1, Malnar and Vodvarka's sensory design theories provide a fruitful theoretical grounding. By emphasizing sensory experience over program, adjacency, and use logics, sensory design is fundamentally "critical" and aware of emotive responses and feelings of wellbeing and lends itself well to designing for neurodiverse persons and to creating inclusive and accommodating environments. Chapter 2 reviews precedents and examples of an emerging architectural style centered around neurodiversity. Chapter 3 extracts key design insights from the previous chapters on sensory design and precedent studies. The thesis concludes with the documentation and description of a design proposal for a student centre for individuals with diverse sensory sensitivities on a site at Carleton University.

Language

Before delving further into this topic, it is important to acknowledge that there is no tidy categorization of sensory sensitivity: almost anyone experiences some level of sensory sensitivity in their lifetime, but this does not make them "neurodivergent." This thesis addresses and concerns itself with a very specific group: the neuro-divergent population. *Neurodivergent Individuals* are defined as those whose cognitive profile differs significantly from the dominant norm.[5] There is no definitive list of conditions associated with neurodivergence, but the term is commonly associated with ASD (autism spectrum disorder), ADHD (attention deficit/hyperactivity disorder), Dyslexia, Tourette's Syndrome, Down Syndrome and other conditions. The shared challenge that unites these varying neurotypes is the family of sensory challenges these individuals face daily as they navigate the built environment.

I have chosen the term "neurodivergent" to identify this population because, at the time of this writing, this language is appropriate to respectfully describe this population. However, I recognize that there may be other terminology that is used or preferable by some.

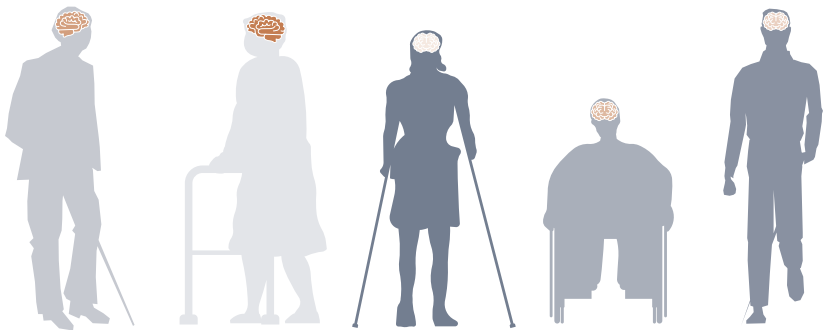

figure 3. Neurodivergence

Endnotes

1 Elisabeth Griffiths, "'But You Don't Look Disabled': Non-Visible Disabilities, Disclosure and Being an 'Insider' in Disability Research and 'Other' in the Disability Movement and Academia." In *Ableism in Academia: Theorising Experiences of Disabilities and Chronic Illnesses in Higher Education*, edited by Nicole Brown and Jennifer Leigh, 124–42, (UCL Press, 2020), 146.

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Chapter 1

Incorporating the Senses into Accessible Design

The relationship between our senses and architecture is dynamic and intricate. Sensory stimuli, and the related cultural and personal associations, shape how we perceive -- and therefore how we behave, engage with, and physically respond to -- environments.[1] The integration of what we see, hear, smell, feel, and even taste create a holistic experience of spaces, making architecture more than just mere physical structures. Each of our senses contribute uniquely to our overall impression of a space, allowing us to engage and interpret our surroundings in a rich and nuanced manner. To showcase the intersecting nature of sensory encounters, I here describe the experience of ascending a stair in the School of Architecture, on a late November morning in 2023:

figure 4. Architecture Bldg. - November 2023

As I approach, my eyes observe the scale and structure of the stairwell as a whole. The coarse, grey concrete communicates the sturdiness of the structure while the combination of the light and shadow provides me with a perception of the height and depth of each step. I grasp the cool metal railing and begin to climb. With every step, my tactile system is engaged. The combination of the solid grey concrete underfoot and the railing I am gripping provide me with a sense of security and aid in my balance. The weight of my foot as it makes contact with the step sends vibrations which I feel through my hand on the railing. As I move, I observe someone standing on the landing above. Measuring the shrinking distance between myself and that person contributes to my overall sense of vertical movement. The echoing sounds of my footsteps notify me of the openness of the stairwell in the large and empty atrium I am moving through. As I continue to climb, the subtle, damp, aromas drifting in from the dewy garden outside grow weaker, replaced by the sharp scent of bleach from the second-floor bathroom. This changing sensation in my nose communicates my progress and informs my brain of what is awaiting me when I reach the top. As I ascend, my basic-orienting system detects the upward and linear acceleration contributing to my sense of balance and spatial orientation. With each step my muscles and joints provide feedback to my brain on the effort and coordination required to maintain and control my overall body position.[1]

1 Tuesday, November 21 2023, Architecture Bldg at Carleton University, 1125 Colonel By Dr, Ottawa ON

In this process various sensory stimuli intermingle creating a dynamic perception of the stairwell and engaging us thoroughly in the act of ascending. The emphasis here is on the collective and overlapping nature of experience. It is the combination of stimuli that establishes our overall perception.

If any one element were changed, the experience would be different. In the same way, if any one of our sensory systems were impaired, so too would the experience be changed. The way the variety of sensory stimuli harmonize or contrast with each other can elicit a spectrum of emotion and responses. The integration of various sensory cues allows individuals to form a profound connection with their built environment. Buildings become immersive and memorable to the individuals who occupy them.

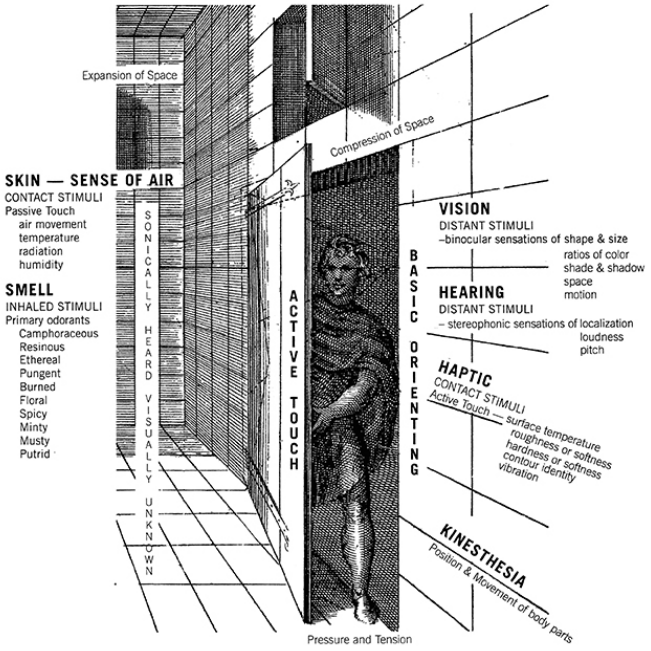

figure 5. Ranges of the Senses

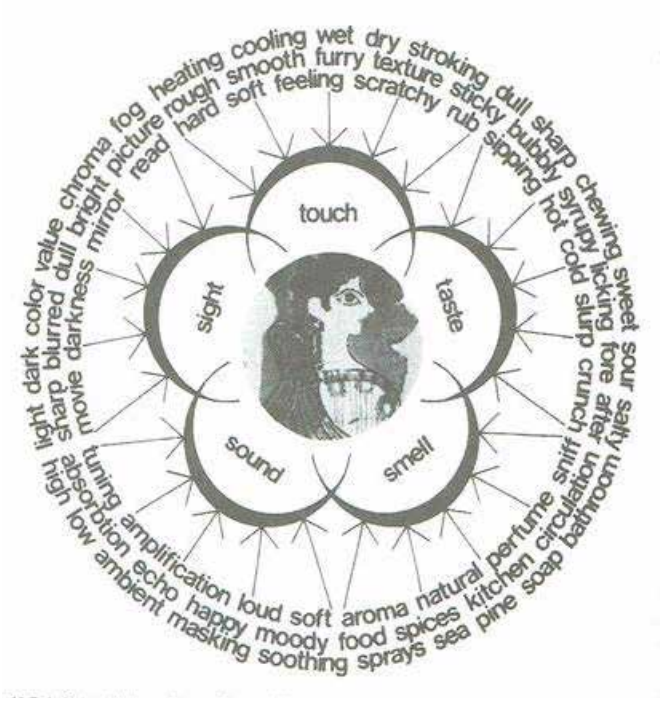

figure 6. Sensory Realm

figure 7. Perceptual Systems

Sensory Processing

Recognizing that architecture is experienced through the integration of various sensory cues, it is important to develop a thorough understanding of human sensory processing.

Sensory processing refers to the way individuals receive, interpret, and respond to sensory stimuli from their environment. Sensory stimuli are gathered by our senses. In *Sensory Design*, Malnar and Vodvarka suggest that a human's full comprehension of place relies on both sensation (the flow of data received through the sense organs) and perception (the data after it is processed and interpreted.[2] These two systems are complementary and work together to shape our understanding of the environment. Malnar and Vodvarka break down the process of human sensory response into three distinct phases. The first is an immediate physical "involuntary response of the sense organs to stimuli." The second intellectualizes the first, layering understanding and awareness to the physical response. The third is a response to the stimulus triggered by our memory.[3] It is this connection to memory that causes stimulus to evoke additional sensations: seeing a photograph can trigger smell. This suggests that our experience of a space is not solely reliant on the information gathered by the perceptual systems. Rather, the combination of the information gathered with personal and cultural memories is what shapes the fundamental architectural experience.

The human senses are generally introduced to us in early education as the "Five Senses": sight, hearing, smell, taste, and touch. However, throughout the history of human sensory mechanics, sensory identification and categorization have been the subjects of debate. In this thesis I have adopted J.J. Gibson's inventory which lists the visual system, the auditory system, the taste-smell system, the haptic system and the basic-orienting system (figure 7). Gibson defines these as "perceptual systems."[4] Perception happens when the brain processes the information gathered by these "perceptual systems." To fully understand the role each of these systems plays, we explore them individually here.

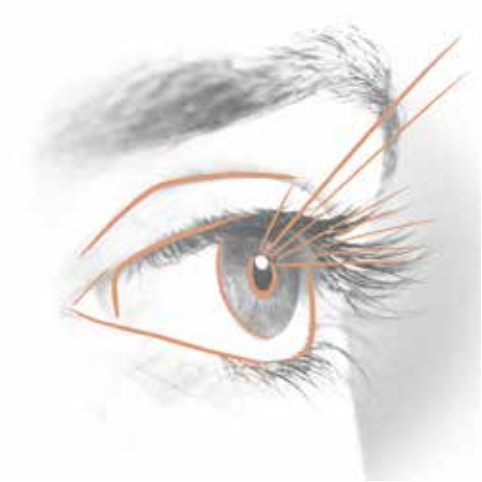

figure 8. Seeing

Seeing: The Visual System

The visual system encompasses the ways in which individuals perceive and interact with their environment through sight. The sensory receivers in the eye focus light on the retina signalling our brain through the optic nerve. Widely understood to be the most influential sense, sight leverages elements such as lighting, colour form, and scale to form a cohesive picture. While other senses are interactive and immersive, vision can be distancing as it "can happen at a safe, antiseptic distance."[5] The dominance of vision is visible throughout the field of architecture.[6] Design is communicated through images: plans, sections, and elevations. However, when the eye is integrated with the rest of the senses, an immersive experience emerges. Our understanding of the environment begins through the eye, and the other senses authenticate this information.

figure 9. Hearing

Hearing: The Auditory System

The auditory experience of space informs us of its intended purpose and context. Acoustic design involves the arrangement of architectural elements -- walls, ceilings, and materials which impact the reflection, absorption, and diffusion of soundwaves -- throughout a space. Barbara Erwine describes the concept of "aural architecture" which is how our experience of the sound space around us provides information about the shape, proportion, and materiality of our environment. Sound is closely related to atmosphere; the sound of a space usually reflects its function. This is especially evident in religious spaces. Think of the great gothic churches where even so much as dropping a coin will be heard throughout the building. The sound of a space informs us of its characteristics, both physical and social: "Every building or space has its characteristic sound of intimacy or monumentality, rejection or invitation, hospitality or hostility."[7] We "hear" scale and size.

figure 10. Tasting

Tasting: The Taste-Smell System

The senses of taste and smell are often combined as they function together; smell amplifies our sense of taste. Smell is one of the more difficult senses to communicate effectively; we often end up borrowing adjectives from other senses to describe it. Cleaning supplies are described as having a "sharp" scent (tactile). Old milk is often described as smelling "sour."[8] Smells have the ability evoke memories both sensory and cognitive.[9] Scents are detected through the same system as that which is responsible for emotional processing: the limbic system of the brain. Some researchers have attributed smell's ability to trigger memory and emotion to this fact.[10]

Our preference for certain smells comes from experiences and is closely connected to context. Erwine uses the experience of smelling rotting seaweed at the seashore to exemplify how a "bad" smell in the right location can be positive.[11] Memories and emotions are what add flavor to the sensory stimuli gathered from our environment. Those associated with scents tend to be enduring and play a significant part in establishing a sense of place. The olfactory experience of architecture is not linear and is dependent on other influences such as temperature, humidity, and air flow. Architects are accustomed to the notion that their choices in the matter of scale and shape impact sensory experience; they must consider the central role that smell plays in emotional and personal experiences.

figure 11. Feeling

Feeling: The Haptic System

The haptic sense or "sense of touch" evokes experiencing the environment with the entire body instead of just the hands. This sense "includes all those aspects of sensual detection which involve physical contact both inside and outside the body" and helps us discover temperature, kinesthetics, pressure, and pain.[12] Touch is sometimes described as "unconscious vision." as it is a deeper and more intimate exploration of what is first understood through the eyes.[13]

figure 12. Moving

Moving: The Basic-Orienting System

The basic-orienting system involves the detection of bodily movements and position. It allows individuals to have a sense of the body's position without relying on visual or auditory cues, allowing a person to perceive and control their body movements. Located in the inner ear, and able to detect any rotational movements of the head, linear acceleration, and positioning with respect to gravity, this system utilizes the vestibular organs to provide a sense of balance and spatial orientation.

This system is intimately related to the haptic in that it involves receptors in muscles tendons and joints working in conjunction with each other to form our understanding of position and movement in the environment. Vestibular perception internalizes our surroundings in our body; "movement, balance, distance and scale are felt unconsciously through the body as tension in the muscular system and in the positions of the skeleton and inner organs." [14] The design of circulation is central to one's perception of architecture through this sense. Layout, placement, and overall flow impact the way in which an individual navigates their environment. More importantly, features such as staircases, ramps and slopes which are centers of movement and circulation can intensely impact one's sensation of movement and balance. Moving through a fire stair (which is generally enclosed in a concrete shaft) is an entirely different experience than walking through a staircase in an open atrium.

Disrupted Experience

After establishing the relationship between sensory processing and architecture, we turn to those individuals whose sensory processing is disrupted. Let us look back at the earlier description of climbing a stairwell. As we saw, it was the combination of stimuli that shaped experience. If one or more perceptual systems is disrupted or impaired, the experience is entirely changed. In the case of an individual who is deaf, their eyes would be working that much harder. Their visual system would inform them of the scale of the space and its occupancy. A sight-impaired child or little person would need to focus significantly more on the act of climbing as standardized stairs are not made for their stature. Overuse of one sensory system leaves little energy for their brain to pick up on other details around them like the changing scents.

These two examples are easily understood due to the obvious physicality of the disabilities. However, the focus of this thesis is on improving accessibility as it relates to the sensory experiences of neurodivergent individuals. Common among the variety of neurodivergent profiles, neurotypes are sensory processing challenges and accompanying cognitive processing challenges. Neurodivergent individuals process sensory stimuli differently than neurotypical individuals. Someone who has trouble filtering and interpreting sensory stimuli will have difficulty processing their environment and will likely experience cognitive processing difficulties. For example, individuals with ASD often experience extreme sensitivity to certain sensory stimuli, leading to sensory-overload or sensory shutdown, and to expressions thereof. Outsiders often interpret these as a form of tantrum. In reality, this individual's response to an inability – or reduced ability -- to process and adapt to their environment at the same pace as the general population is the cause. It is important that architects understand sensory overload. If the built environment is designed based on neurotypical experience, then it will never be truly accessible. Today, most spaces are created to meet the dominant norm's level of sensory processing and everyone else must either catch up or stay home.

Sensory design creates enriching experiences which enhance the wellbeing of individuals interacting with the built environment. This approach goes beyond visual and physical aspects of design and creates a more accommodating and accessible environment for a diversity of sensory sensitivities. Accessibility lies at the heart of sensory design in that is "supports everyone's opportunity to receive information, explore the world, and experience joy, wonder, and social connections, regardless of our sensory abilities."[15] This is why sensory design is the proper path to true accessible design. At its core it is a user-centric philosophy, rejecting ocular-centric design to include all sensory experience. Architects have the unique task of not only creating visually appealing designs but orchestrating a multisensory experience that transcends the purely visual aspects of space.

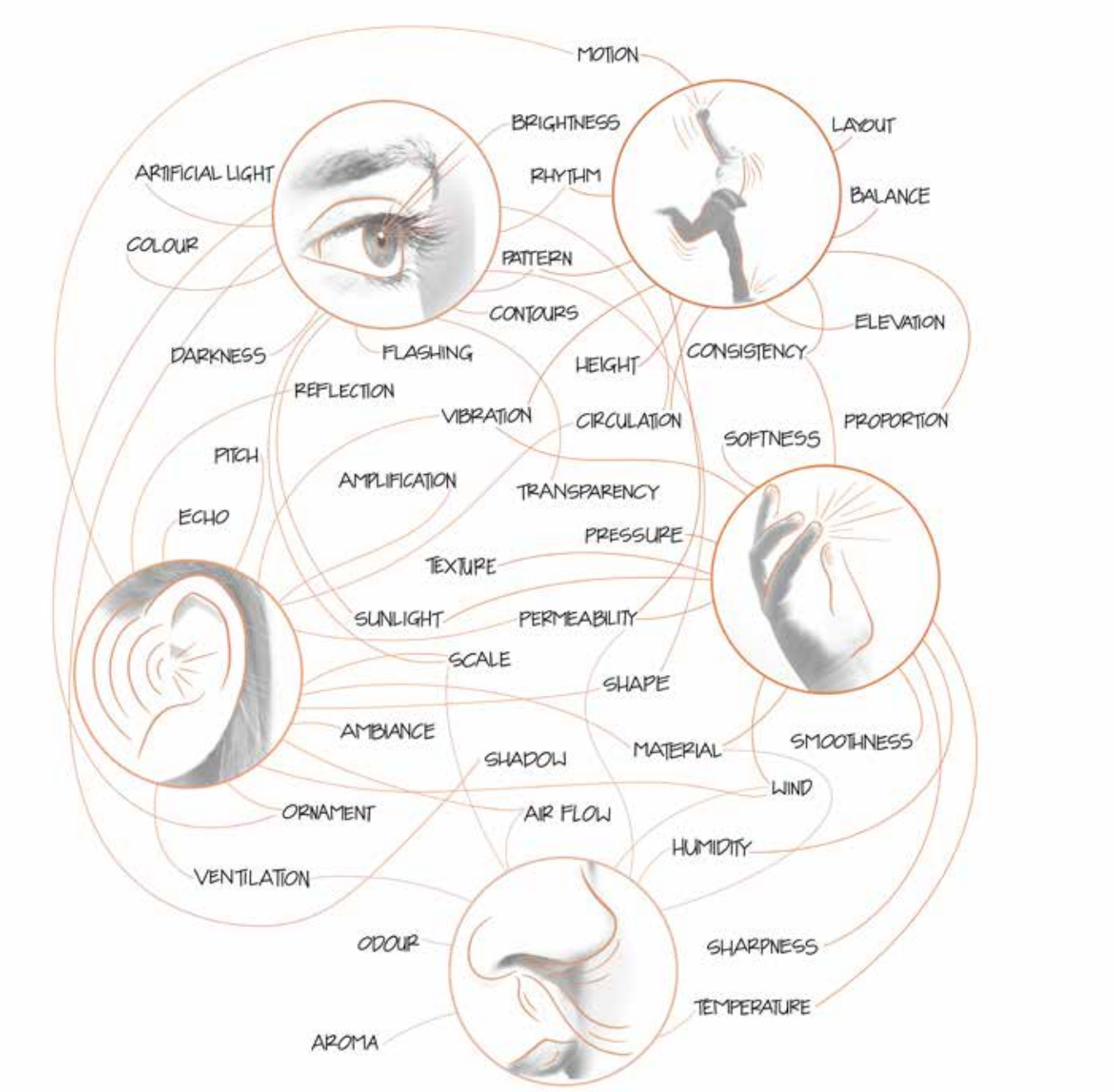

figure 13. Mapping Sensory Stimuli

Endnotes

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Chapter 2
An Emerging Field

Building on the study of sensory processing and sensory design in Chapter 1, this chapter delves into the realm of neuro-inclusive accessibility within the field of architecture. Neuro-inclusive design is a nascent, crucial, yet largely unexplored, aspect of architectural accessibility. Architectural research on this topic, which tends to be limited in its scope and availability, focuses on design for autism spectrum disorder (ASD), and its application in early childhood centers and elementary schools. This thesis draws on these resources but expands their application to a broader neuro-divergent population and beyond the above-mentioned settings.

Exploring Models of Accessible Design

The field of accessible design has evolved over time. A comprehensive understanding of the history of accessibility and inclusivity relies on understanding the evolution of design guidelines. The following history will support the development of a design approach that promotes inclusivity to the greatest extent necessary for the neurodivergent user.

Early roots of accessible design can be traced back to the "barrier-free" movement of 1960s America. This movement focused almost exclusively on physical disabilities and perceived accessibility as a curative approach to disability. Accessible strategies focused largely on solutions to physical limitations in the built environment.[1] Universal design emerged in the early 1980s as an expansion of barrier-free design.[2] The term was coined by Ronald Mace with the publication of his article "Universal Design: Barrier Free Environments for Everyone" which framed accessible design as "good design" that was economically feasible, functional, and attractive for all. According to the *Universal Design Network of Canada,* universal design is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.[3] Universal design lists seven principles: Equitable Use, Flexibility in Use, Simple and Intuitive Use, Perceptible Information, Tolerance for Error, Low Physical Effort, and Size and Space for Approach and Use.[4]

In the last twenty years there have emerged counter perspectives which frame discourse about universal design as negative. By collating all disability as "universal" many needs are left unmet. Grouping disabilities leads to the prioritization of "physical" accessibility in accessible design guidelines. Critical Disability Studies researcher Aimi Hamraie argues that the contemporary universal design tends to neglect the specific needs of disabled communities by simplifying the concept to more general "good" design practices.[5] It is important, instead, to embrace and celebrate the diversity of disability. In *Inclusive Design: Designing and Developing Accessible Environments,* a critic of Universal design states "it is difficult to see how far transformations in disabled people's lives can occur without the development of a social or political programme for change and in this respect, the core philosophies of universal design are unhelpful."[6]

Inclusive design is often used in conjunction with universal design. However, inclusive design surpasses universal design in its specificity: inclusive design is "about designing for the needs of people with permanent, temporary, situational, or changing disabilities – all of us really."[7] Inclusive design is a development of universal design that – instead of being a merely technical response or add-on, incorporates the views, values and experiences of building users, and challenges both the technical and social aspects of building and design. In addition, as opposed to accessibility standards that are oriented to the institution, this approach is participative, oriented to the person, and responsive to both the building owners and its users.[8] This approach considers the diversity of the users from the outset of the design process, rather than as an afterthought. The goal of inclusive design is to benefit everybody, not just those with disabilities. By considering the full range of human diversity, ability and disability, inclusive design aspires to lead to environments that are more usable, intuitive, and enjoyable for all.

Neuro-Inclusive Design

The term "neuro-inclusive" redirects the perspective of inclusive design to the concept of neurodiversity. The use of "neuro" identifies the relationship to the nervous system and the brain. *Neuro-* is a Greek root, meaning "sinew", "tendon" or "nerve".[9] In the modern context, the prefix is used more casually to indicate the connection to the brain and related neurological processes. The use of the term *neuro-inclusive* refers to an approach that considers the diversity of neurological profiles. Neuro-inclusive design is an approach that goes beyond accessibility to create architectural environments that cater to the diverse sensory needs of individuals. This approach seeks to eliminate barriers and create solutions to accommodate this diverse populations while recognizing and celebrating each individual's unique sensory experience.

An Emerging Field

Neuro-inclusive accessibility is a largely unexplored topic in the field of architecture and few resources exist today. The majority of those from which this thesis draws center on architecture and design for individuals with Autism Spectrum Disorder (ASD). While ASD does not entirely encompass the target users this thesis is addressing, the design considerations for ASD users are based on sensory processing challenges related to the condition. Because of this, the design solutions presented in these resources can extend beyond ASD users to aid in the support of a wider spectrum of neurodivergent users.

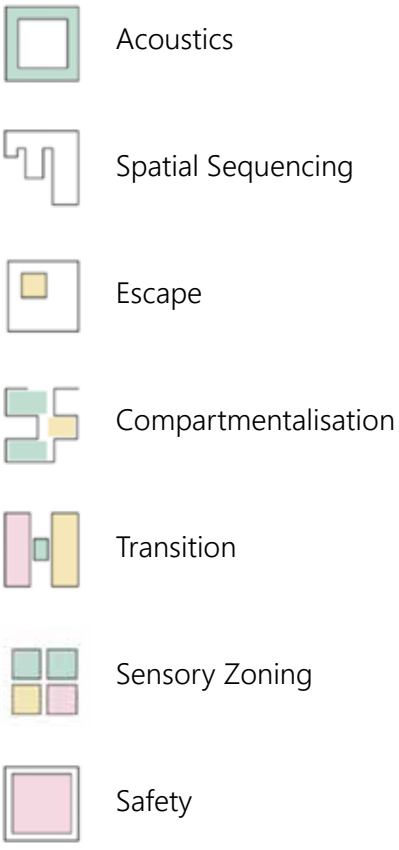

figure 14. ASPECTSS Concepts

ASPECTSS

The Autism ASPECTSS Design Index was developed in 2013 by Magda Mostafa, a professor of Design in the Architecture Department at The American University in Cairo. Dr. Magda Mostafa is a leading expert and innovator in architectural design for autistic and neurodivergent individuals. Mostafa's Index is a research-based framework that responds to the notable gap in research on autism and the built environment, inclusion research, accessibility codes and design guidelines.[10] ASPECTSS (figure 14) is comprised of seven criteria: Acoustics, Spatial Sequencing, Escape Space, Compartmentalization, Transitions, Sensory Zoning, and Safety. This index is based on a Sensory Design Matrix which generates design guidelines for each sensory profile it examines. Due to the spectrum nature of autism, each sensory profile responds differently, presenting as hyposensitive to hypersensitive (or anywhere in between). Mostafa develops a general sensory profile made up of the most common sensory challenges faced by autistic users. The latter serves as the foundation for the Autism ASPECTSS Index.[11] ASPECTSS recognizes that it is unrealistic if not impossible to customize public space to meet to unique needs of each user; it therefore provides criteria on the elements which most impact the experience of autistic and neurodivergent individuals.

The Autism Friendly University Design Guide

In 2018, Dublin City University (DCU) was designated the world's first autism-friendly university; this initiative implemented the university's commitments to "adapting the environment, raising awareness and acceptance, and building initiatives to make it as easy as possible for autistic community members to participate fully in university life."[12] The University's campus has been adapted to be more accepting and supportive of the students and staff on the autism spectrum. This includes the introduction of a number of "quiet spaces" (figures 15-17) where students can go and take time, unwind, and find a sense of inner calm when they are feeling overwhelmed by sensory stimuli.

Another aspect of DCU's commitment was the development of an Autism Friendly University Design Guide (AFUDG). The guide layers concepts and guidelines specific to the special needs and abilities of autistic individuals over standard best practices of architectural design and site planning.[13] This guide is the first of its kind and provides a remarkable precedent for improving accessibility in a university context. The ASPECTTS Index (2013) was incorporated into the development of the AFUDG to develop a new iteration the 2.0 version of ASPECTSS. This new iteration – an extension of the original index – includes principles of colour, lighting, material selection, furnishing, wayfinding and navigation, technology, sensory economics, and programming and operation to further develop a detailed guidance on autism friendly design.[14]

figure 15. The Labyrinth

figure 16. The Intra-Faith Centre-Quiet Room

figure 17. Escape Hatch

figure 18. Color-Coded Wayfinding

figure 19. Private Booth

Design for the Mind - Neurodiversity and the Build Environment - Guide

In 2022, The British Standards Institution published a new design standard to provide guidance on the design of buildings, external spaces and residential accommodation for "multiple sensory processing differences and conditions."[15] The guide is considered to be the first standard on this topic developed by a national standards body and may serve as a first step for future public policies internationally. It recognizes the gap in building standards when it comes to neuro-inclusive accessibility and provides clear and distinct guidelines in an effort to provide inclusivity for all.

Design for the Mind provides guidance on sensory-related building elements including spatial and functional planning, materials, air quality, temperature, noise and sound characteristics, patterns and visual noise, light, glare, and reflections. It also provides supportive examples of the benefits of neuro-inclusive design, be it social, environmental, or economic. The guide is a good precedent for the more technical aspects of neuro-inclusive design and, more importantly, it marks the impressive move towards a more holistic understanding of accessibility to include neurodivergence. The BBC Cymru Wales Broadcasting Centre in Cardiff is an example of a recent project which incorporated the design guide to build a neuro-inclusive workplace (figures 18-19).[16] Further development, integration, and positive practices of this guide in the built environment would be beneficial in validating these design practices.

Architecture professor and Autism specialist Dr. Magda Mostafa published a study in 2023 with the objective of exploring the efficiency of the ASPECTSS concepts as drivers of design intervention for students with ASD.[17] The study integrated the criteria to retro-fit a Pre-K-12th Grade school for students with ASD. The study assessed the efficiency of these interventions as well as their impact via classroom observations, a staff survey, and interviews. Study results showed positive perception of the interventions. Additionally, the study found that the design strategies of ASPECTSS and ASCPECTSS 2.0 improved the experiences of neuro-typical users in the school's new spaces.[18] This evidence supports the implementation of these neuro-inclusive strategies as they can be understood not exclusively as methods of accessible design but more broadly as methods to improve overall experience and quality of life for all building users. Accessible design is good design.

The positive perception of interventions and the potential benefits to neurotypical users reinforces the notion that neuro-inclusive design is not only about accessibility but also about overall user experience and quality of life. In the subsequent sections, we aim to unravel the multifaceted strategies that encompass neuro-inclusive design. The discussion focuses on specific design features that will contribute to the creation of approachable and comfortable architectural spaces. The design proposal that concludes this thesis will be guided by these features.

> *"Good design – thoughtfully composed ordering systems and patterns, sequentially active materials and textures, deliberately constructed sequences of spaces – create coherent places that have a powerfully positive effect on people. Urban spaces, landscapes, and buildings – even small and modest ones – profoundly influence human lives. They shape our cognitions, emotions, and actions and even powerful influence out well-being. They actually help constitute our very sense of ourselves, our sense of identity."*
>
> Welcome to Your World: How the Built Environment Shapes Our Lives.
> Sarah Williams Goldhagen. 2017.

Endnotes

1 Aimi Hamraie, "Universal Design and the Problem of 'Post-Disability' Ideology" In *Design and culture 8*, (no. 3 (2016): 285–309), 291.

2 Hamraie, "Universal Design and the Problem of 'Post-Disability' Ideology", 293.

3 Universal Design Network of Canada, *7 UD Principles and 9 Goals*, (https://universaldesign.ca/principles-and-goals/).

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5 Hamraie, "Universal Design and the Problem of 'Post-Disability' Ideology", 302-303.

6 Robert Imrie and Peter Hall, *Inclusive Design: Designing and Developing Accessible Environments*, (New York: Spon Press, 2001), 16.

7 *Inclusive Design Principles*, (https://inclusivedesignprinciples.org/).

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12 Magda Mostafa, *The Autism Friendly University Design Guide*, (Autism Friendly DCU, Dublin, Ireland, 2021), 6.

13 Mostafa, *The Autism Friendly University Design Guide*, 10.

14 Mostafa, *The Autism Friendly University Design Guide*, 63-73.

15 The British Standards Institution, *PAS 6463:2022 Design for the Mind: Neurodiversity and the Built Environment – Guide*, (London, United Kingdom, BSI Standards Limited, 2022), viii.

16 Alan Bainbridge, *How the BBC's Cardiff building considers neurodiversity in creating an inclusive workplace*, (Architect's Journal, UK., 2019) https://www.architectsjournal.co.uk/news/opinion/how-bbcs-cardiff-building-considers-neurodiversity-in-creating-an-inclusive-workplace.

17 Magda Mostafa et al., *The Impact of ASPECTSS – based Design Intervention in Autism School Design: A Case Study*, (International Journal of Architectural Research, Archnet-IJAR. 10., 2023), 2-5.

18 Mostafa et al., *The Impact of ASPECTSS – based Design Intervention in Autism School Design: A Case Study*, 19.

Chapter 3

Developing Neuro-Inclusive Design

As discussed in Chapter 1, inclusive design means understanding the full range of neurodivergent experiences. Appealing to such a vast spectrum of needs is a monumental task. What is more, sensory sensitivities are dependent on context and circumstance, and continually change.[1] A neuro-inclusive design methodology must approach users as diverse and evolving. As the experience of the neurodivergent community is not stagnant; neither should be the design. The question will be: how to design in terms of ranges of perspectives and experiences? How to design on a spectrum?

Experiences of one's environment are unique and can never be repeated exactly the same way. This becomes evident looking back at the description of ascending the stairwell in Chapter 1. This description was based on my own personal sensory experience of ascending a specific stairwell on a rainy November morning. To go back now, the experience and my description of it would be somewhat different:

It is late afternoon in early March and the atrium is busier and louder. The hustle of the building teeming with activity distracts me and I don't notice the same wet warm scent I remember distinctly from my earlier experience. I am not the only one moving on this stairwell now and it is harder to differentiate the vibrations of my own movements from those of others. Several conversations buzz around me making my attempts to recognize and note the sensory stimuli more difficult.[1]

As is evident, this is not the same experience as the one described in detail earlier. I am relatively unchanged - more tired perhaps – but the same individual with the same capacities for sensory perception. The difference in descriptions is due to the evolutionary nature of human experience. Sensory experience is not constant but fluid and it is in this fluidity that the notion of "spectrum" emerges.

1 Wednesday, March 6, 2024, Architecture Bldg at Carleton University, 1125 Colonel By Dr, Ottawa ON

The Spectrum Approach

This thesis proposes a "spectrum approach" for design founded on an understanding of the unique nature of every individual's experience of space in conjunction with an analysis and identification of the architectural elements most active in producing a "sense of place." Erwine emphasizes architects' role in cultivating this sense "by paying attention to our body's delight at nodes of sensory intensity or whimsical illusions and attending to the flow of time and movement."[2] Developing this notion further, we can ascertain that architectural spaces which support neurodivergent persons are non-static and adaptable. Erwine underscores the importance of approaching spaces in terms of ranges rather than as rooms with fixed qualities, to respond to a great diversity of needs: "The job of a designer is to orchestrate the sequence of sensory experiences to increase the probability of delight."[3]

> **Spectrum** (n.)
> *figurative.*
>
> The entire range or extent of something, arranged by degree, quality, etc.
>
> (Oxford English Dictionary)[4]

As a "range of similar qualities," the notion of "spectrum" makes sense of the dynamic nature of neurodivergence and of the fact that individuals' sensory needs and abilities constantly change. The term "on the spectrum" was added to the Oxford English Dictionary in 2017 to mean "diagnosed with or having the characteristics of an autism spectrum disorder come to be associated with Autism."[5] Because the term "spectrum" suggests degrees as well as plural and transdisciplinary thinking, it is a promising architectural design construct. Accordingly, as a range rather than a fixed form, the spectrum welcomes flexibility and adaptability in architectural solutions. Just as the "spectrum approach" in the medical field made it possible to shed the exclusive character of diagnoses, it holds promise in inclusive architectural design. Able to recognize the unique needs and experience of every individual, the spectrum supports a holistic approach and reframes architectural design as a multifaceted field providing dynamic spaces that can be customized for their occupant resulting in greater inclusion, equity, and engagement. The spectrum is well-suited to design for the diverse sensory experiences of the neurodivergent community.

In the context of this thesis, the "spectrum" spans from hyper- to hyposensitive design. When looking at the spectrum of sensory needs, it is appropriate to begin by approaching hypersensitive needs. Indeed, establishing a hypersensitive baseline allows for further adaptations and additions of sensory stimulus to appeal to the hyposensitive community as well. In her 2008 research Mostafa writes "it is easier to add stimulation from an external temporary source…. than to remove stimulation from the environment."[6] The design of shared or public spaces – that must appeal to the widest grouping -- requires this baseline. The baseline is then modified -- enhanced, reworked and amended – to evolve with the needs of its occupants. The baseline is developed via the identification of commonalities in neurodivergent experience. The analysis of existing literature and guidelines on the topic has here resulted in the formulation of a repertoire of features that assist in identifying patterns of sensory barriers.

The following images illustrate the initial exploration of Neuro-Inclusive Design that was done through the casting of plaster models. The plaster models (figure 20) have been photographed with figures to represent different form and scale.

figure 20. Conceptual Plaster Models

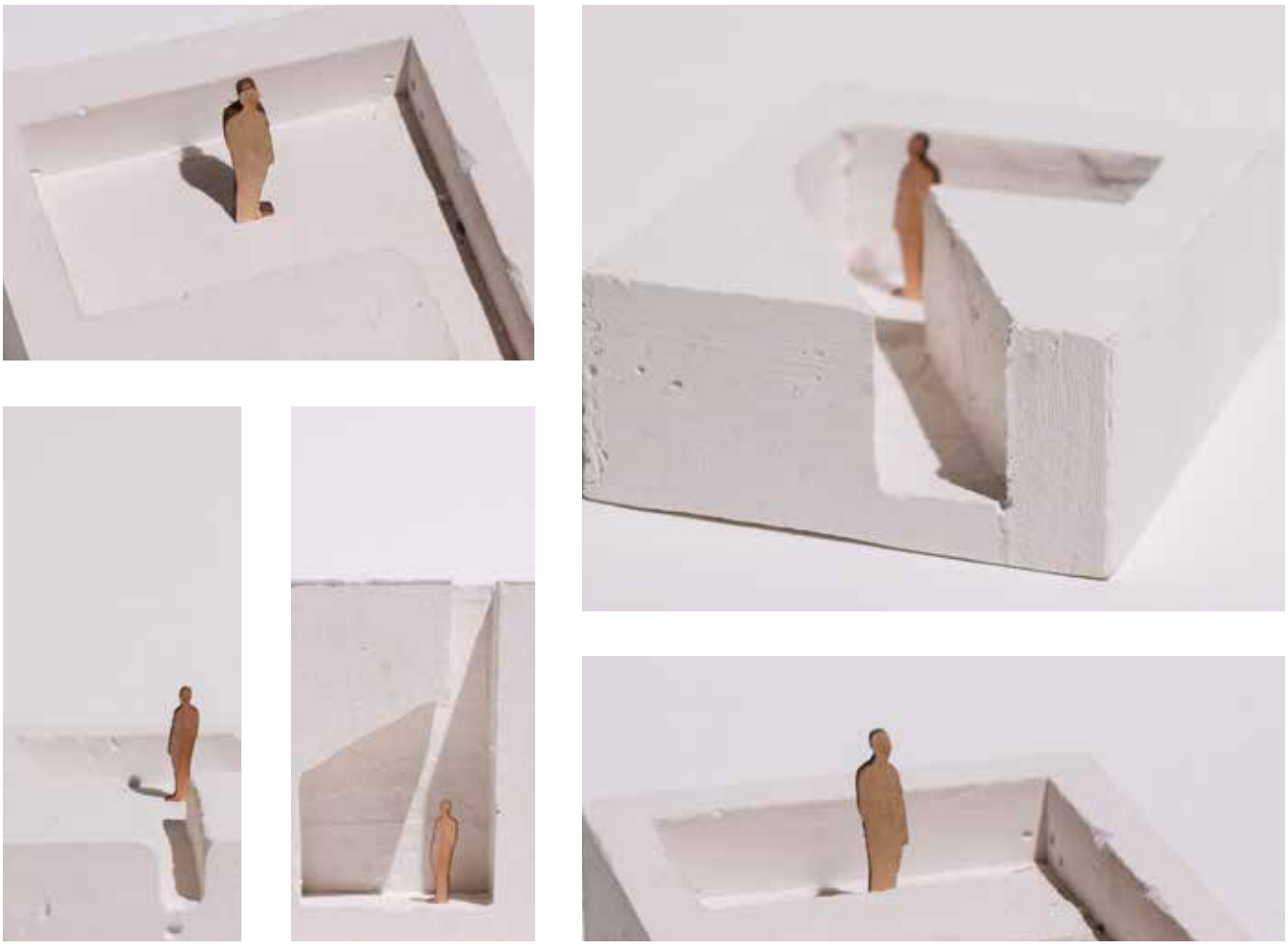

figure 21. Occupying the Plaster Models

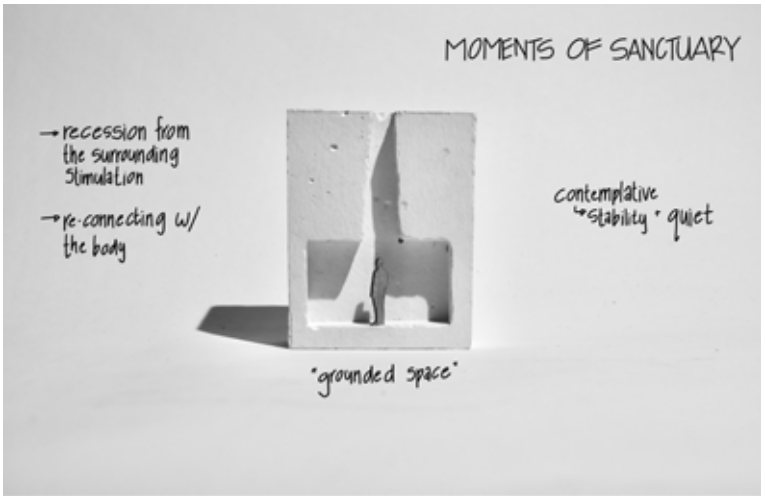

figure 22. Conceptual Plaster Model: Moments of Sanctuary

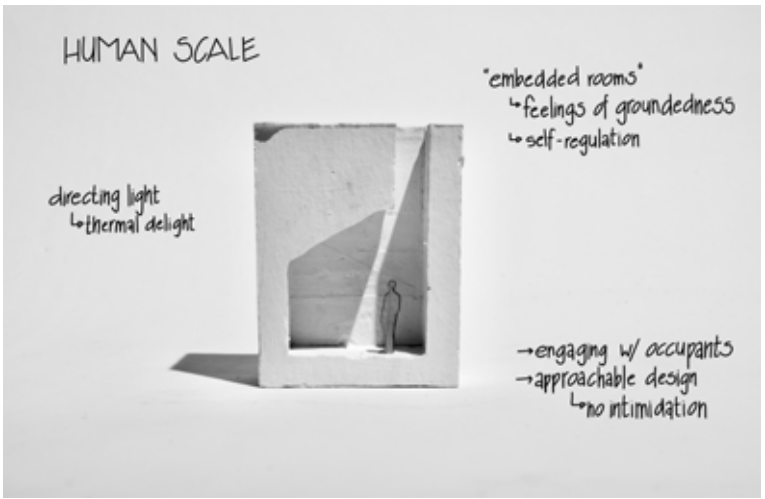

figure 23. Conceptual Plaster Model: Human Scale

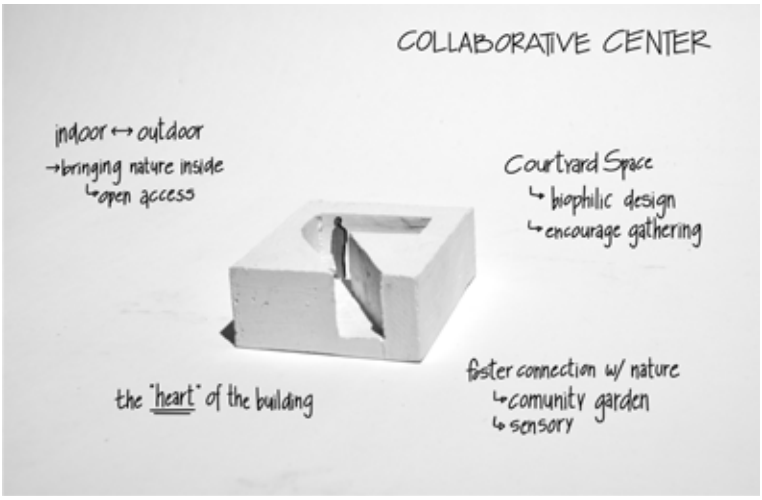

figure 24. Conceptual Plaster Model: Collaborative Center

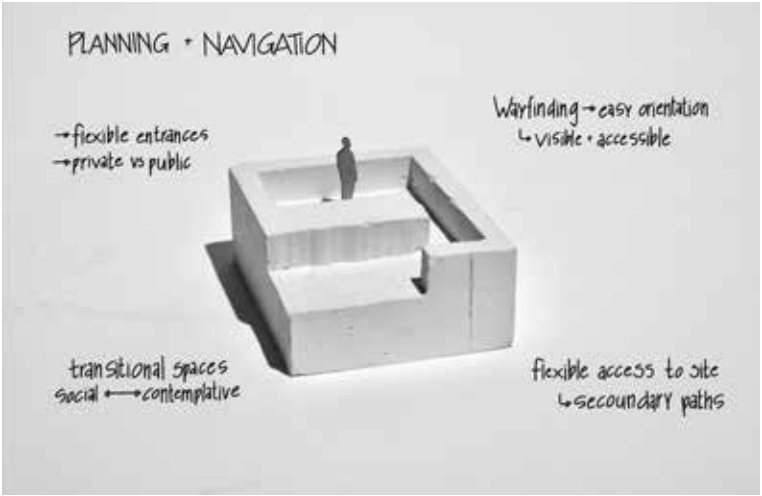

figure 25. Conceptual Plaster Model: Planning and Navigation

Features of Neuro-Inclusive Design

Intuitive Order

An important element in making space comfortable and accessible is ensuring the space is easily navigated. Intentional planning and well-design navigation can enhance functionality, foster independence, and contribute to positive user experience. The ability to navigate through a space is not only a practical necessity, but it also empowers individuals and provides them with autonomy.[7] ASD specific research states that spaces that are predictable and laid out in orderly ways aid in limiting the overwhelming sense that public environments can induce in individuals.[8] But how to organize space?

Mostafa's research for ASPECTSS determined that autistic users identify the architectural environment in accordance with its sensory character rather than its function.[9] In limiting the sensory inputs of an environment, designers can facilitate concentration and focus for its users. The theory of "sensory zoning" builds on this finding and organizes spaces according to their sensory quality. The sensory environments are limited, and each zone has a clearly defined function and predictable stimulus level. This approach recognizes that various sensory experiences can impact people differently. This predictability increases user comfort and limits anxiety in providing an inclusive environment where individuals can engage with various sensory stimuli based on their comfort level and requirements.

Transitions play a large role in establishing a sense of order and predictable routine within a building. Appropriate transitional spaces allow building users to recalibrate their senses as they move from one sensory zone to another. These are areas which indicate to a user that they are moving between high-stimulus and low-stimulus zones. This strategy connects adverse sensory zones smoothly while acknowledging their distinct function. As Erwine explains, proper design of transitional spaces is complex: "In creating the transition from one sensory experience to the next, a designer must first explore the underlying patterns of movement through the space and the cultural expectations along this path."[10] For example, designing a small reception space between a public atrium and a more private meeting room would allow for more comfortable adjustment between private and public. In turn, Gaines, Kleibrink, Bourne, and Pearson invite designers to consider the concept of "previewing" -- to "observe, ponder, digest, and learn what appropriate behaviour is and to develop an understanding of what activities take place in that room" – when designing for neurodiverse dwellers.[11] In the above design, by designing the reception space with views to the public atrium, individuals are spared from feeling confronted when entering that new space. The concept of previewing can be achieved through spatial openings such as multi-level spaces with views from above, large windows, and windows in doors, where the visitor can glean a sense of what is coming next.[12]

Visibility and Previewing

The concept of previewing is relevant to the visibility of a space. Most literature on design for autistic users discusses the importance of architectural communication. Spaces which visibly communicate their purposes and the expected behaviour within them empowers building users to be informed and independent as they navigate their environment. Building materials, textures, colours, and shapes all contribute to a user's mental map of a space.[13] Paying closer attention to what these characteristics are communicating and being intentional when assembling them is especially important for cognitive clarity during navigation.

Prospect-Refuge theory is the idea that humans have a natural desire to preview a space before entering it as well as a desire for areas in which to hide within that space.[14] This theory underscores the importance of being able to survey an environment, and for places of retreat or escape routes. These help individuals understand and prepare themselves before entering. Secondary routes and discrete spaces within larger ones help to counter the feelings of lack of control and vulnerability to which neurodivergent individuals are prone. Prospect-Refuge theorists also assert that spaces which provide for prospect and refuge encourage social interaction.

The design challenge is to offer views while avoiding "open concept" spaces, as these have the undesired effect of disrupting an individual's basic orienting. The theory insists on the importance of clear markings of the division of spaces especially between levels, on balconies, or stairs. Details like transparent railings and floating stairs are especially distressing for individuals whose spatial perception and cognition is impaired due to basic orienting challenges. Clear delineation can be achieved in a number of ways including the use of contrasting materials, using portion and scale to create dominance, and adding molding to the perimeter at floor and ceiling level.[15] Simple and subtle additions like these help in establishing a sense of clarity of a space and aid in an individual's assurance of safety as they move through it.

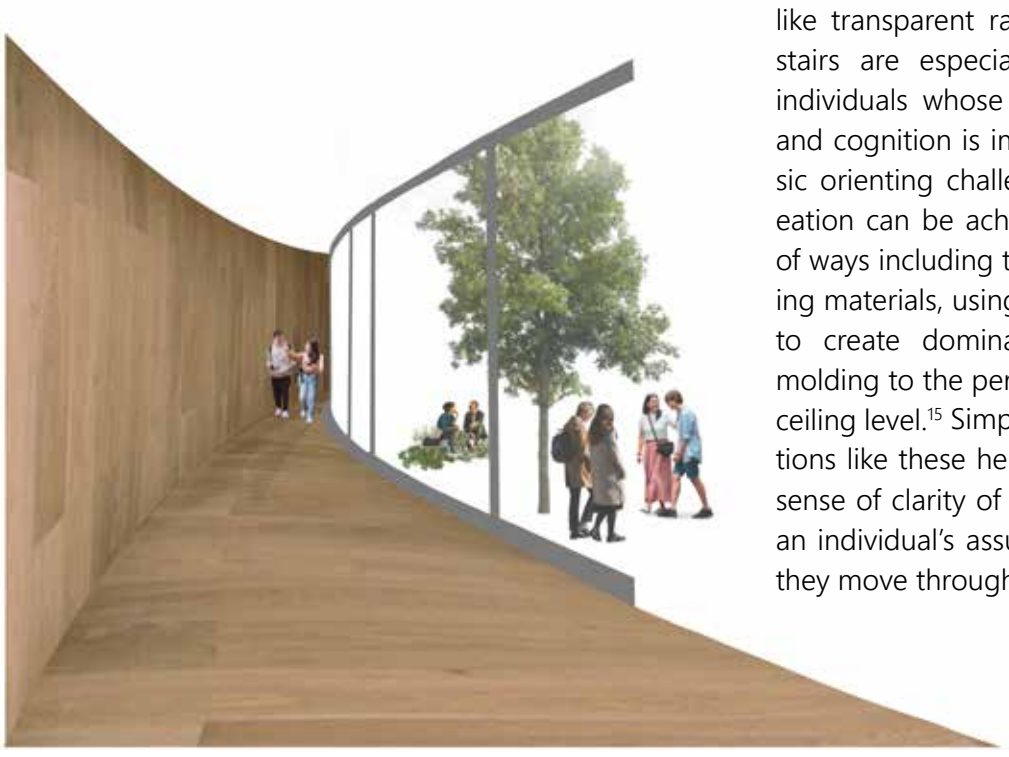

figure 26. Previewing

Biophilic Integration

Biophilic integration incorporates the natural world into the built environment. It is based on theories of human's innate connection to nature and the belief that exposure to the natural world has beneficial effects on building inhabitants. The incorporation of living plants and vegetation can not only improve air quality but can also be therapeutic, and improve concentration and cognitive processing.[16] According to *Design for the Mind,* biophilic integration is not only the inclusion of plants, it includes natural finishes, materials or patterns, connection to the surrounding environment through views, lighting and natural shapes, and natural design features such as organic form and textures.[17] Interventions such as the provision of additional windows, or maximizing access to natural light have been shown "to have a number of stress-reducing benefits as well as a number of positive emotional and physiological changes."[18]

figure 27. Natural Green Playground

figure 28. NeuroArchitecture and Landscaping

figure 29. Carleton Campus Picnic Bench

The incorporation of a sensory garden is a conventional biophilic design strategy, and one that is especially relevant to neuro-inclusive design as it creates an engaging and stimulating sensory experience. Sensory gardens provide direct exposure to nature and engage the senses in a holistic and immersive way. A sensory garden stimulates the senses through a variety of plants, texture, colours, scents and sounds, and promotes relaxation, engagement and social interaction. It can include various tactile elements such as pebbled pathways or soft grass, a selection of plants and flowers with a diverse variety of colours, textures and fragrances. The sensory garden shown in figure 27 includes water features to add auditory as well as visual stimulation. Another acoustic addition to consider is windchimes. Providing a peaceful retreat while moving through the built environment, sensory gardens can operate as spaces for building users to self-regulate. These should include a range of seating and path options to suit multiple ideas of comfort and foster a sense of choice and control over one's environment (figure 28). Agency, we recall, is paramount in shaping a neurodivergent individual's experience.

figure 30. Biophilic Design for a Sensory Garden

Moments of Shelter

Sensory barriers in the built environment can at times be so overwhelming or distressing that certain individuals are unable to cope. For a person who is not able to filter, process, or interpret this stimuli, the bombardment of sensory stimuli often results in "sensory overload."[19] The answer is a "shelter." Magda Mostafa includes this type of space in her ASPECTSS criteria, naming it "Escape Space." The objective of "Escape Space" is "to provide respite for the autistic user from the over-stimulation found in the environment."[20] These are spaces where individuals can self-regulated and "escape" the stresses of their environment before re-entering it. These can be implemented at varying scales and degrees.

figure 31. Snoezelen Room

figure 32. Sensory NOOK

The implementation of sensory rooms or sensory pods is generally an approach used in early education settings geared towards children prone to sensory overload. These are meant to be areas of solitude where a child can relax and regain control before the sensory overload becomes too much. The multi-sensory environments are generally small and adaptive to their user. Figure 31 shows an example of a Snoezelen Multi-Sensory Environment which incorporates projection, fiber optics, interactive panels, wall and floor cushions, and more, to create fully immersive environments that match individual sensory preferences. These are not only used for children but have also been used to support individuals at all ages in practices such as Alzheimer's and dementia therapy, brain injury rehabilitation, developmental and neurological disability engagement, and mental health interventions.[21] The Sensory NOOK (figure 32) is a similar case study founded on the ideas of multi-sensory engagement. The NOOK incorporates adaptive sensory technologies into a workspace for individuals or groups with the purpose of providing a calm refuge especially for the neurodivergent community without excluding them from the public environment.

Scale is also an important factor to consider when designing for shelter. The scale of a space is an important indicator of its function; it informs users of the appropriate behavior within a space. Smaller more intimate spaces induce feelings of calm and support. Human scale and proportion play an integral role in creating approachable, comforting architecture. Research has stated that individuals' discomfort approaching and maneuvering through a space is impacted by their body-orienting system. Design interventions such as rounded corners, entry canopies, wider pathways, and low ceiling areas which look out to more open spaces can decrease that discomfort and improve user engagement within that space.[22]

As demonstrated above, neuro-inclusive design requires many considerations. Intuitive order, visibility and previewing, biophilic integration and moments - all evoke a kind of space that must be able to contract and expand, and to reveal and conceal, at the same time. In turn, biophilic design and sensory zoning underscore the importance of the senses themselves – but again, these must alternately be heightened or subdued for each individual occupant. The spectrum construct, while suggesting range and distance, points the way toward an architecture that is calming and reassuring by the mere fact of holding difference within itself. A spectral approach reframes design. Spaces are not static entities, but adaptable environments designed to orchestrate a series of sequential sensory experiences well-fitted to a multitude of preferences and needs. This "fitted-ness" welcomes and increases the probability of delight for the broadest range of users. To go further, designing on a spectrum responds to hypersensitive and hyposensitive needs alike, providing stimulation and sanctuary for both. In the formation of a built environment, where each individual's unique sensory experience is valued and accommodated, architectural choices must be woven together alongside each other to form one cohesive building.

Endnotes

1 Kristi Gaines et al., *Designing for Autism Spectrum Disorders*, (New York, NY: Routledge, 2016), 45.

2 Barbara Erwine, *Creating Sensory Spaces: the Architecture of the Invisible*, (New York: Routledge, Taylor and Francis Group, 2017), 261.

3 Erwine, *Creating Sensory Spaces*, 245.

4 Oxford English Dictionary, s.v. *spectrum (n.), sense 3.d.* (September 2023, https://doi.org/10.1093/OED/1179885729).

5 Oxford English Dictionary, s.v., *'on the spectrum' in spectrum (n.), additional sense*, (September 2023, https://doi.org/10.1093/OED/2746085501).

6 Magda Mostafa, *AN ARCHITECTURE FOR AUTISM: CONCEPTS OF DESIGN INTERVENTION FOR THE AUTISTIC USER*, (In ArchNet-IJAR 2,no. 1 (2008): 189–211), 204.

7 Gaines et al., *Designing for Autism Spectrum Disorders*, 99.

8 Gaines et al., *Designing for Autism Spectrum Disorders*, 98.

9 Mostafa, *AN ARCHITECTURE FOR AUTISM*, 205.

10 Erwine, *Creating Sensory Spaces*, 245.

11 Gaines et al., *Designing for Autism Spectrum Disorders*, 99.

12 Gaines et al., *Designing for Autism Spectrum Disorders*, 22.

13 Gaines et al., *Designing for Autism Spectrum Disorders*, 99-103.

14 Gaines et al., *Designing for Autism Spectrum Disorders*, 15.

15 Gaines et al., *Designing for Autism Spectrum Disorders*, 87-89.

16 The British Standards Institution, *PAS 6463:2022 Design for the Mind: Neurodiversity and the Built Environment – Guide*, (London, United Kingdom, BSI Standards Limited, 2022), 35.

17 The British Standards Institution, *PAS 6463:2022 Design for the Mind*, 36.

18 Gaines et al., *Designing for Autism Spectrum Disorders*, 183.

19 The British Standards Institution, *PAS 6463:2022 Design for the Mind*, viii.

20 Mostafa, *AN ARCHITECTURE FOR AUTISM*, 147.

21 *Benefits and Applications | Snoezelen Multi-Sensory Environments*, (https://snoezelen.info/benefits-and-applications/).

22 Gaines et al., *Designing for Autism Spectrum Disorders*, 104-105.

Chapter 4

The Neuro-Sanctuary - A Design Proposition

Neuro-inclusive design theories beg to be applied. The following chapter explores the translation of the previous theories into an articulated form. Indeed, a study on neuro-inclusive architecture would be incomplete without an architectural proposition. A distinct architectural proposal will incorporate the above principles, thereby showcasing the spectrum construct as a habitable spatial journey replete with choices, and even places in which to find refuge. The practical application of neuro-inclusive design highlights architectural considerations for a real-world context. Analysis of neurodivergent sensory experiences paired with corresponding neuro-inclusive design strategies has led to the conceptualization of a campus building which will be named *The Neuro-Sanctuary*.

figure 33. Representing Sanctuary: Plaster and Wood Model

The term sanctuary brings up images of a retreat from the outside world; it fosters a sense of refuge, peace, and relaxation. In a religious context, a sanctuary is "a sacred place, set apart from the profane, ordinary world."[1] The idea of retreat from the outside world is relevant to the discussion of sensory accessibility. What Magda Mostafa calls "Escape Space" or what *Design for the Mind* terms "quiet and restorative spaces" represent similar interventions: spaces *set apart* from their broader context to provide refuge. Further analysis of the word evokes a sense of control of one's environment. "Sanctuary provides the conditions for survival; it attempts to establish a space of control apart from the larger realm of unknown or uncontrollable factors."[2] For many neurodivergent individuals, the unpredictability and lack of control of the outside world can increase feelings of stress and of being overwhelmed. Because it provides an individual with "conditions for survival", a sanctuary is a place that can be made one's own; it is predictable, adaptable, and made unique to the person seeking solace within it.

> *"When my sensory processing issues happen, functions like sleep, focus and ability to react to the limitations of my environment are disrupted or non-existent. Retreating to a quiet environment for a while, dimming the lights, and resting make a huge difference."*
>
> Stumbling through Space and Time: Living life with dyspraxia.
> Rosemary Richings. 2022.

This thesis presents a sanctuary for the neurodivergent community in the built environment, from the built environment. *The Neuro-Sanctuary* is carefully curated to be sensory friendly, catering the needs of a diverse population. It serves as a kind of safe-haven for the neuro-divergent community for whom the built environment can be uncomfortable.

Carleton University

In reviewing possible sites for this proposal, I determined that a university campus would be an appropriate location due to its multifaceted role in modern society. Universities are hubs of diversity where students, faculty and staff from various backgrounds, cultures, and abilities, come together. Universities operate as influential institutions within their communities. Ideally, the university and the community have a mutually beneficial relationship. The community provides the university with its student body and the university returns these students as skilled and knowledgeable citizens who can contribute to their community's development. It is widely agreed that the university campus is considered a center of activism, direction and "the moral forces shaping the 'civilized' society."[3] As centers of activism and social change, universities have the power to inspire broad societal shifts. By leading the way in implementing neuro-inclusive design, a university campus could become a precedent for inclusivity, accessibility, and acceptance of diverse neurological needs.

Additionally, the university campus is a dynamic space which fosters learning, innovation, and collaboration. By embracing the emerging practices of neuro-inclusive design, campuses can cultivate an environment that supports the cognitive profiles of all individuals. Further, incorporating the features of neuro-inclusive design will enhance the experience for everyone, promoting equal access to knowledge and opportunities. Because higher education has become more widely accessible, the university campus itself should reflect accessibility to the greatest possible extent. The last thirty years have seen an increase in the number of students with disabilities enrolled in Canadian Universities.[4] This is a result of increased accessibility but also a recognition of the necessity of obtaining a university education to compete in today's job market. Assuring accessibility at a university affords individuals with disabilities are allowed the same opportunities to succeed professionally as those without. However, research on college and university access suggests that students with neurological and developmental disabilities face significant challenges when it comes to a university education.

The majority of literature discussing the design of architecture for neurodivergent individuals focuses on primary and secondary educational environments. Apart from Mostafa's *The Autism Friendly University Design Guide,* there has been very little work done on improving accessibility for these individuals once they graduate from high school. As a result, many of these students experience harsh transitions these students face when moving to a university environment. The supports that these individuals have relied on from kindergarten through high school are no longer available to them. At the end of their secondary education, they are left to fend for themselves; "thrust" into the world without any supportive transition. As a result, there is a significantly higher dropout rate for students with disabilities than for those without.[5] This points to a significant need for Canadian universities to provide the educational and mental supports necessary to assure success in this new environment. Understanding the university campus as a microcosm of its broader society substantiates it as the proper site for this architectural proposal. This thesis chooses my own university, Carleton University, as the site for a design.

figure 34. Carleton University Campus

Carleton University, located Canada's capital, boasts a tradition of anticipating and leading change. It sits on a plot of land nestled between the Rideau River and Rideau Canal not far from the downtown core of Ottawa. In 1952, what was originally Carleton College became Carleton University when royal assent was given to The Carleton College Act. Section 3 of the Act states that the objects and purposes of the University include the intellectual, social, moral, and physical development of its members and the betterment of its community."[6] This statement makes explicit the University's responsibility in extending beyond its role as an academic institution to foster social progress and contribute to the betterment of its community. Today, the University has approximately 30,678 full and part-time students (based on 2022-23 numbers).[7] Within this population we find, of course, a group of neurodiverse students.

figure 35. Alumni Park - Carleton Campus

The Most Accessible University in Canada

Accessibility has been a longstanding priority at Carleton University. The Carleton Accessibility Institute operates as a key unit of the university to "highlight, celebrate and cultivate Carleton's expertise, leadership and collaboration with the community to create greater accessibility and a more inclusive world."[8] The institute contributes to a number of research projects and initiatives on and off campus pursuing advanced accessibility-related research and engagement.

The Paul Menton Centre (PMC), founded in 1990, has operated for almost 35 years, working to increase accessibility and integration of students with disabilities into all aspects of university life. Paul Menton, the Centre's namesake, was a quadriplegic Carleton graduate who served as the first coordinator of Carleton's program for the disabled.[9] In the early years of the university, he worked to develop a culture of equal access, inclusion, and integration throughout the campus. Carleton's campus is also home to the national office of the Canadian Accessibility Network, a national collaboration founded under the leadership of the Carleton Accessibility Institute which seeks to advance accessibility for persons with disabilities through research, innovation, education and training, policy, employment, and community engagement. These and numerous other accessibility-related initiatives operate through Carleton University. Carleton's positioning as the foundation and hub of this accessibility network is representative of the University's commitment to exemplifying accessibility in all typologies.

> *"I was a lot more on my own than I ever had been. As great as my new-found independence was, I still wasn't well informed enough about my disability to make the right choices. Suddenly, I was my own advocate, and I was making a horrible job of it."*
>
> Stumbling through Space and Time: Living life with dyspraxia.
> Rosemary Richings. 2022.

The Site

The chosen site is the lot north of Alumni Park (figure 35), nestled into the east side of the O-Train boundary. Currently, there resides an eight-story parking garage (P9) on the site (figure 38); however, according to the Carleton University Capital Plan, the garage will be demolished in the Fall of 2024.[10] This leaves an ideal opportunity for this proposal.

The University's 2023 Campus Master Plan Update notes that the site's location "at several key view termini" gives it an important landmark location on the campus.[11] The site is located at the border of the West and East Campus Precinct. While the West Campus Precinct is largely academic, the East is a mix of recreational, administrative and maintenance buildings. The site is still easily accessible to and from the West Campus via the pedestrian tunnel (figure 39) under the O-Train line. This pedestrian journey allows for a natural transition from the more intimidating academic campus to this more quiet and tranquil space. One on end, its location along University Drive and at the termination of Raven Road (figure 42) emphasizes a connection to Carleton's eastern gateway, Bronson Ave, Brewer Park, and Old Ottawa South. At the same time, because it is set back from the road, embedded in the O-Train hill and more directly connected to Alumni Park, the site evokes a sense of respite from its busy surroundings. By stretching from University Drive to the O-Train hill, the swath of land now occupied by the parking structure inherently provides a successful balance between connection and refuge and suggests a journey.

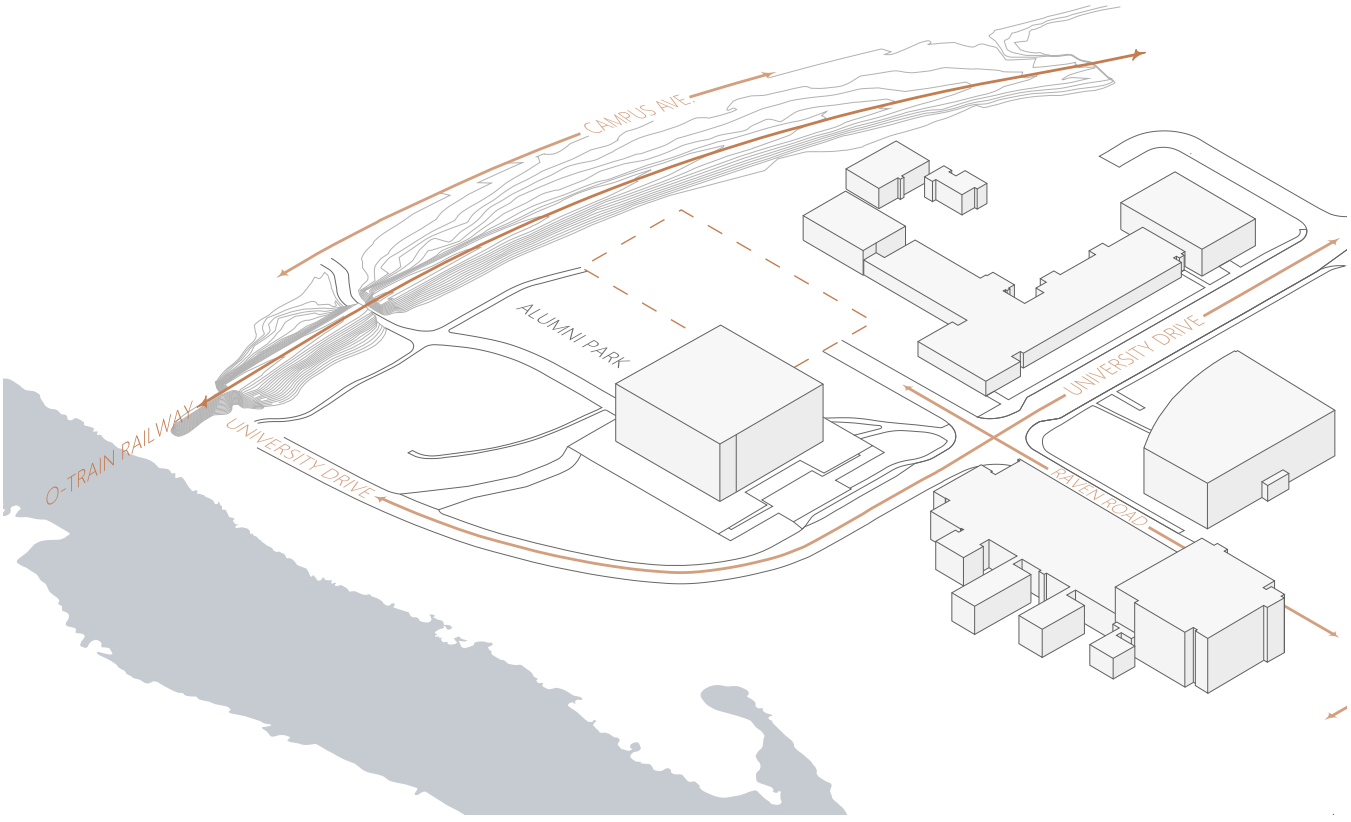

figure 36. The Site

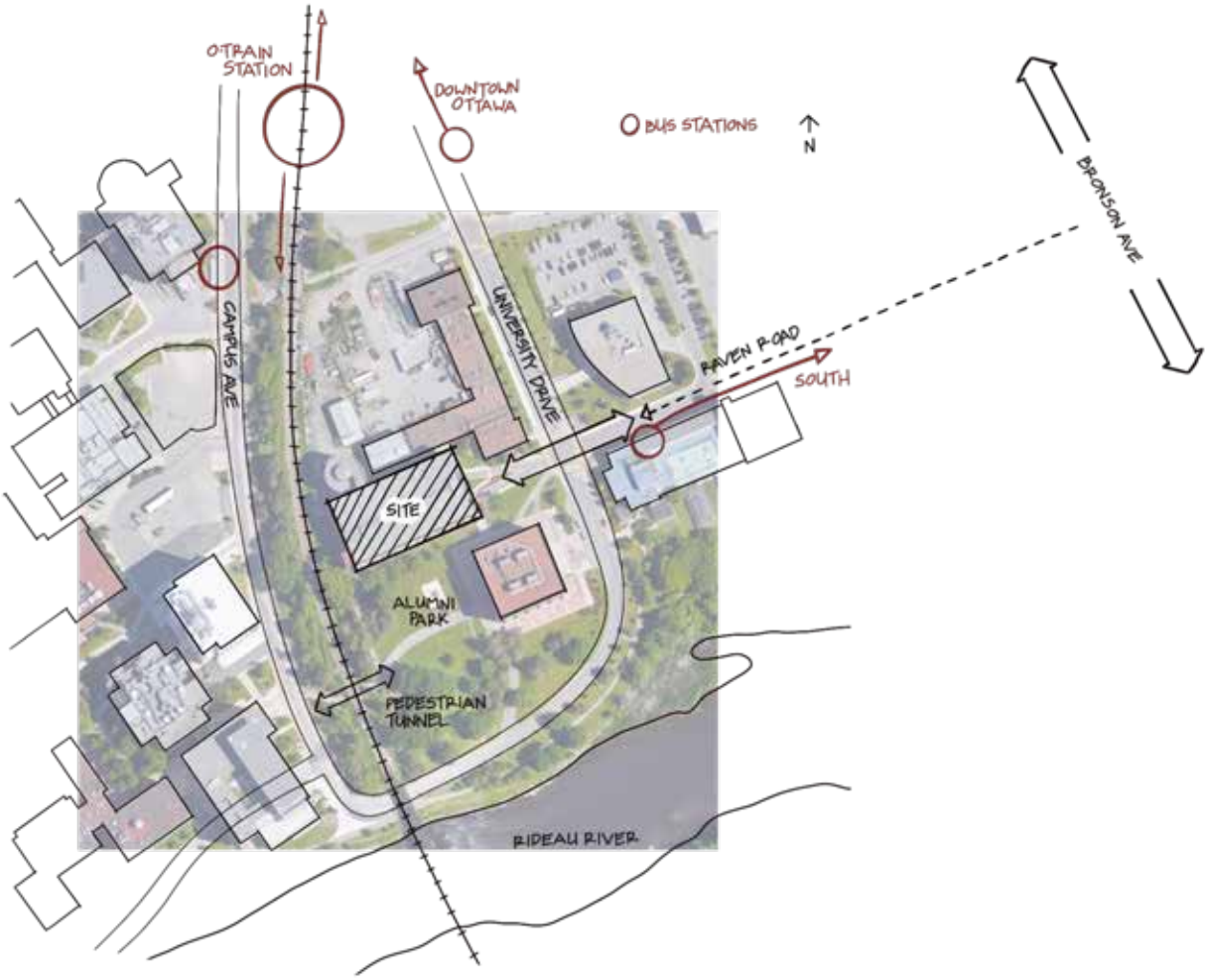

figure 37. Site Context

figure 38. P9: Existing Parking Garage

Bordering the North end of the site is a two-story service building identified on Carleton University's campus map as "Maintenance Building." The L-shaped building stretches along most of that end, contributing to the sense of shelter along the North and West facades. This is balanced with the opening out to Alumni Park and the positioning at the termination of the Raven Road Campus entry. Adjacent to the site on the south side is the Pigiarvik (ᐱᒋᐊᕐᕿᒃ) Building. This building – formally Robertson Hall – was renamed in 2022; Pigiarvik (pronounced *pee-ghee-awe-vik*), which translates to "a place to begin" or "the starting place."[12] This four-story building is the campus's main administrative building.

figure 39. The Journey to the Site - Pedestrian Tunnel

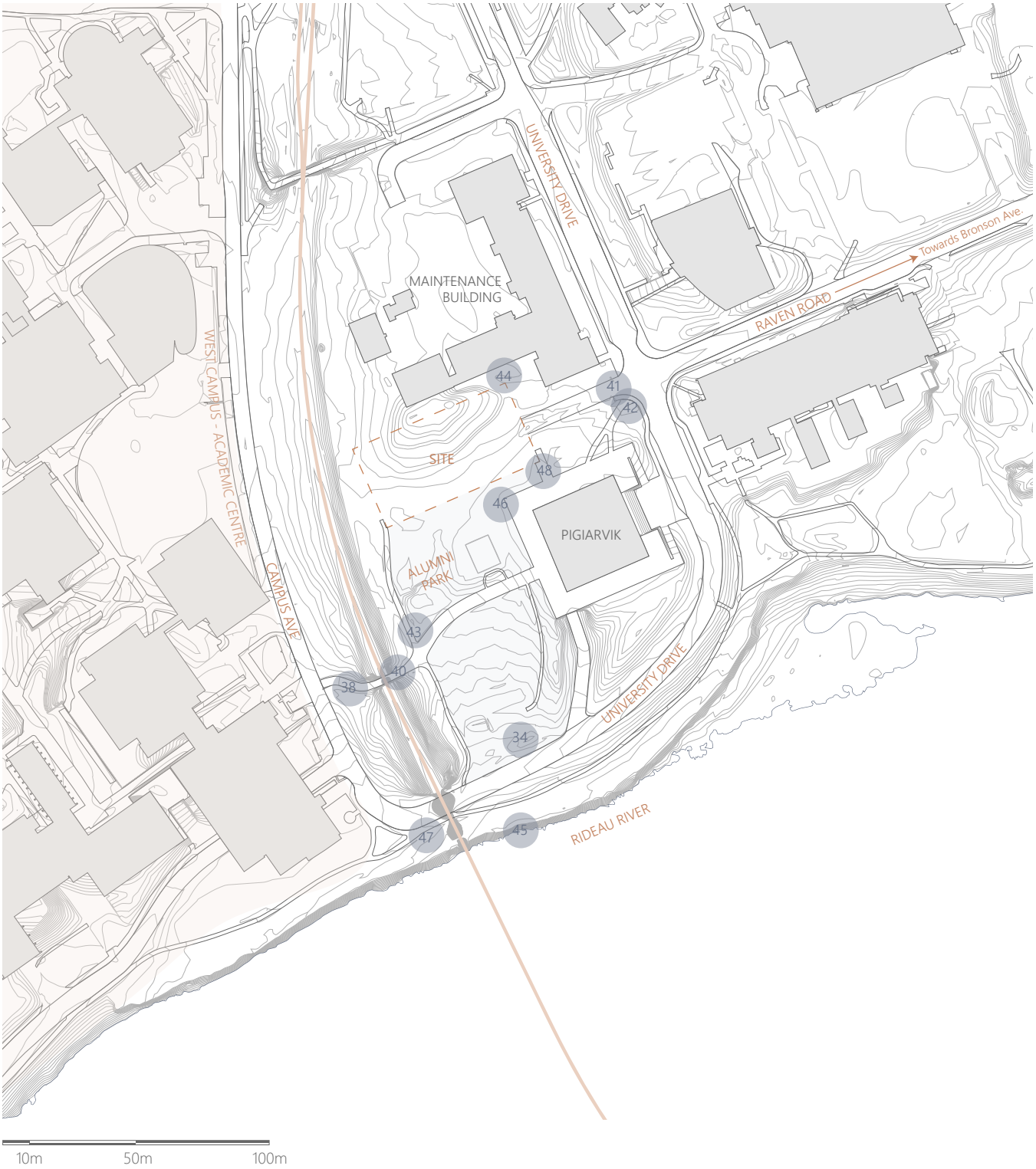

figure 40. Site Plan
Please refer to figure numbers for corresponding site photographs.

figure 43. Intersection at site's entrance


figure 41. View of Alumni Park from tunnel


figure 42. View of Raven Rd. from site


figure 44. View of the O-train hill from Alumni Park


figure 45. The north border of the site


figure 46. Rideau River


figure 47. View of Alumni Park from site


figure 48. New pedestrain bridge across the Rideau River


figure 49. View of Alumni Park

The Proposal

The design of *The Neuro-Sanctuary* seeks to create an optimal place of comfort and belonging for a population so often made uncomfortable by a built environment not designed for them. As discussed earlier, neurodivergent students face significant challenges at university. This proposal is driven by the desire to provide the educational and mental support necessary to facilitate success in this new place and to do so in an accessible and neuro-inclusive environment. This thesis proposes a building for Carleton University where neurodivergent students can access support, obtain accommodations, and develop community (and a community base) on campus. The proposal's program is the result of an analysis of Carleton's existing support services (PMC, The Accessibility Initiative, READi) and my own consultations with the staff who run these programs. The multi-disciplinary program, based in *The Neuro-Sanctuary*, incorporates Life and Social Skills Development, Mentoring Programs, Peer Supports, Counselling and Adaptive Education Delivery, drawing from the models discussed in *Supporting Students with Autism Spectrum Disorder in Higher Education*.[13]

The proposal adopts the features and strategies discussed in Chapter 3 using strategies like sensory zoning (figure 50), previewing, prospect-refuge, transitional spaces, shelter, and sanctuary and biophilic design. The design acknowledges the diverse sensory needs of its occupants, providing a range of accommodating and flexible environments. The building's facilities provide comprehensive support including sensory regulation spaces, rooms for counselling, private and co-working areas, accommodated testing and exam rooms, and other life-skills facilities. The design of the shared spaces promotes engagement and community building while the division of space respects the privacy and dignity of each individual. Approachable and straightforward wayfinding promotes autonomy and empowers the individuals using the space.

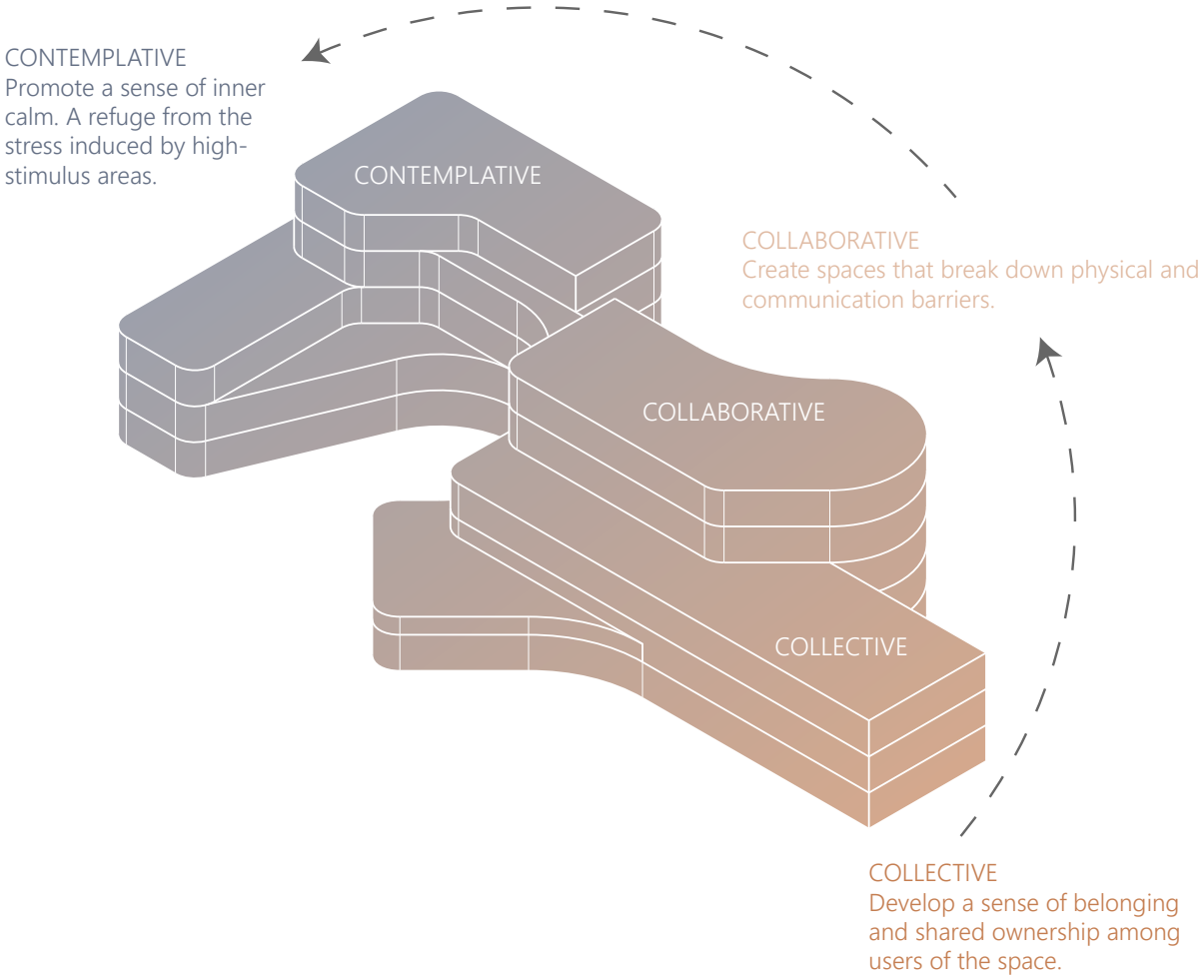

figure 50. Massing and Sensory Zoning

The Program

The scale of the site provides vast opportunity for this space. This thesis identifies key program elements which make up the centre while acknowledging that additional uses may be applied to the unused areas, these key program elements are:

Community Kitchen

A communal cooking and dining space designed to be accessible to community members who struggle with the busier, louder characteristics of the campus cafeteria. The Kitchen is a shared space that is supplied with essential appliances necessary for simple food preparation.

Student Lounge

A social space which promotes interaction and connection in a supportive environment.

Co-Working

This area is made up of informal meeting and team-work spaces with flexible furniture to accommodate a range of sizes and needs.

Courtyard

The courtyard is the central feature and gathering space. It is fitted with individual and communal seating arrangements. This is a multifunctional space that can accommodate various community events and activities.

Sensory Garden

The garden will contain an assortment of plants, pathways, and seating arrangements to create a rich and relaxing sensory environment.

Reading Room

A compact space containing books and other informational resources on topics of accessibility and neurodiversity. The room provides an enriching environment for quiet work or study.

Sensory Pods

Controlled private environments that are designed to have minimal stimulation and can be customized to provide an individual's desired stimulus type and level. The pods incorporate lighting, sound, temperature, texture, colour, and air flow elements that can be adjusted. The controlled sensory stimulation helps individuals self-regulate, reducing stress and anxiety.

Counseling Rooms

These are designed to serve as satellite offices for health and wellness staff. These rooms are intentionally located away from the busier areas to ensure privacy and foster a calming and supportive environment.

Examination Space

This is a satellite location for the McIntyre Exam Centre where students with accommodations can write their test and/or exams in a location specifically designed for this use.

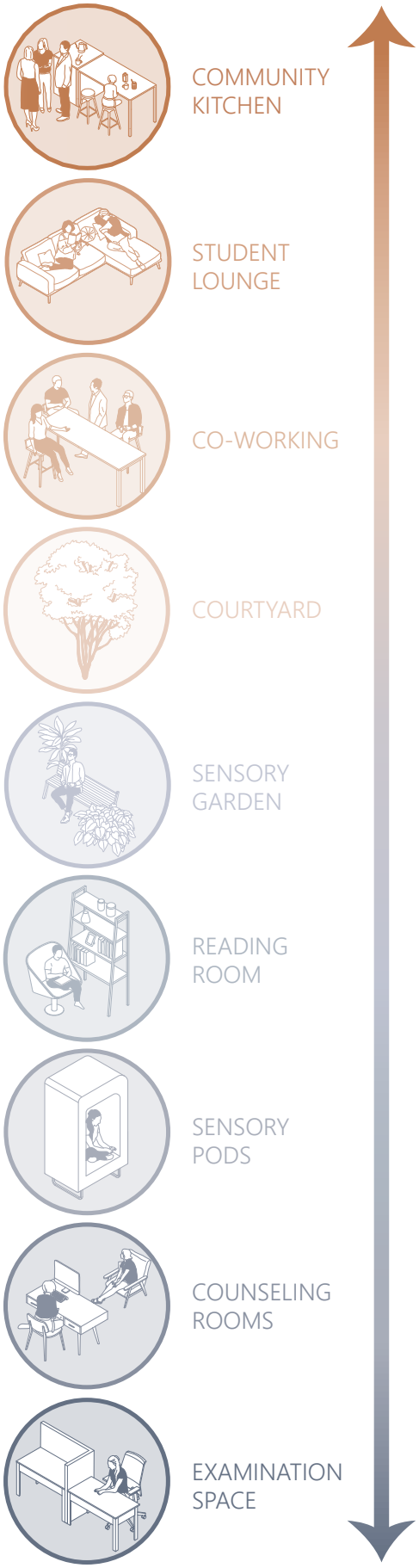

figure 51. Program Elements Along the Spectrum

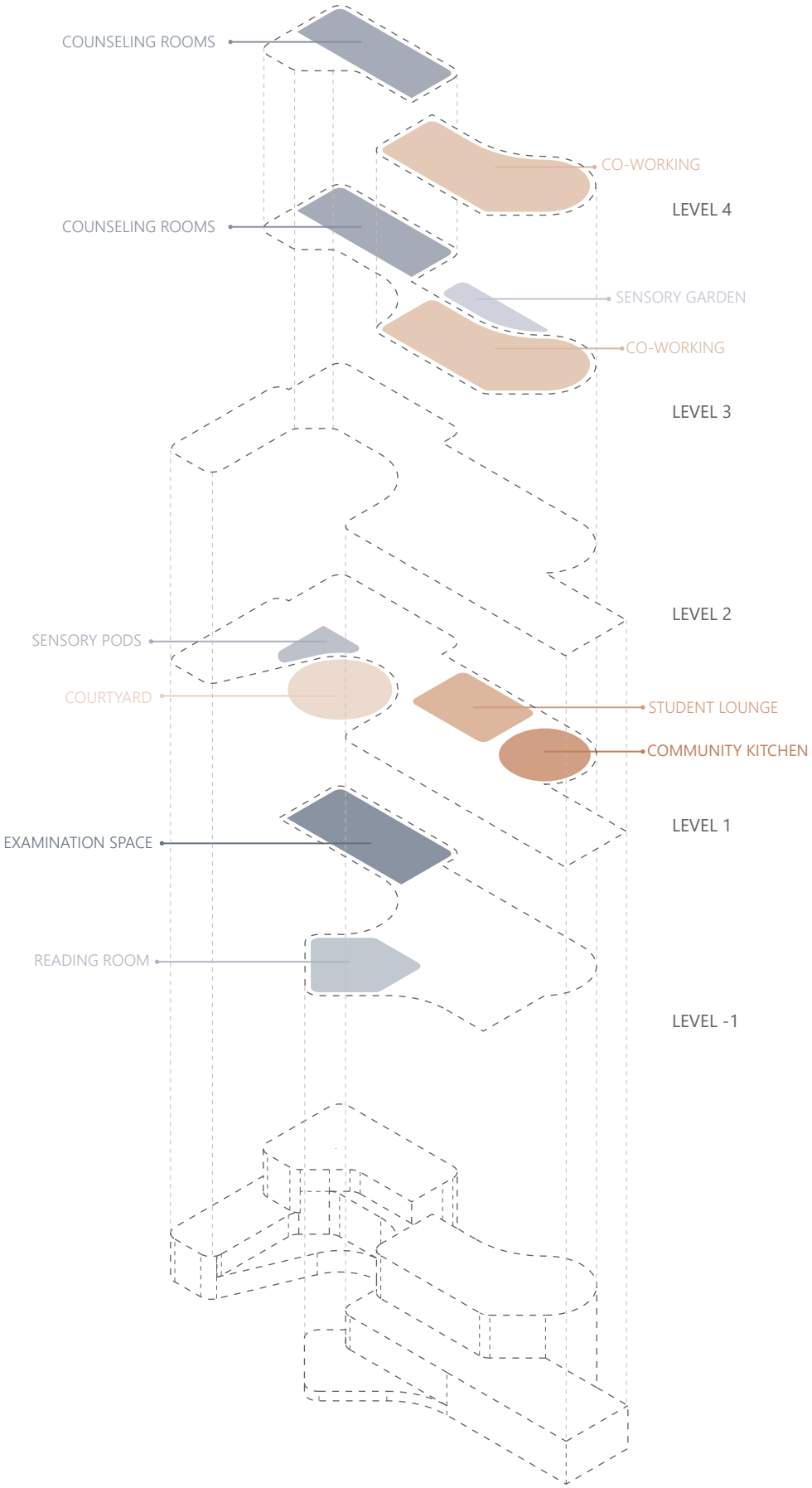

figure 52. Incorporating the Program into the Massing

The Design

The building's design is guided by the understanding that the spectrum of neurodiversity stretches from hyper- to hypo- sensitivity. Incorporating the cues of Sensory Zoning, the program components organize themselves in a logical order according to their function and level of stimulus (figure 51). From east to west, the building organizes a journey from the anonymous and very public University Drive and its flagship administration building *Pigiarvik* (formerly Robertson Hall) to the secluded rail line embankment. In turn, from west to east, an extroverted mass oriented towards the quad progressively gives way to an introverted realm buffered by the adjacent Maintenance Building. As students move further into the site, they are guided along a spectrum path from high to low stimulation. The spectrum approach blends the chaos of the sensory world into an architectural narrative, creating a sense of continuity and unification between the two extremes. The spine of the building is its circulation core.

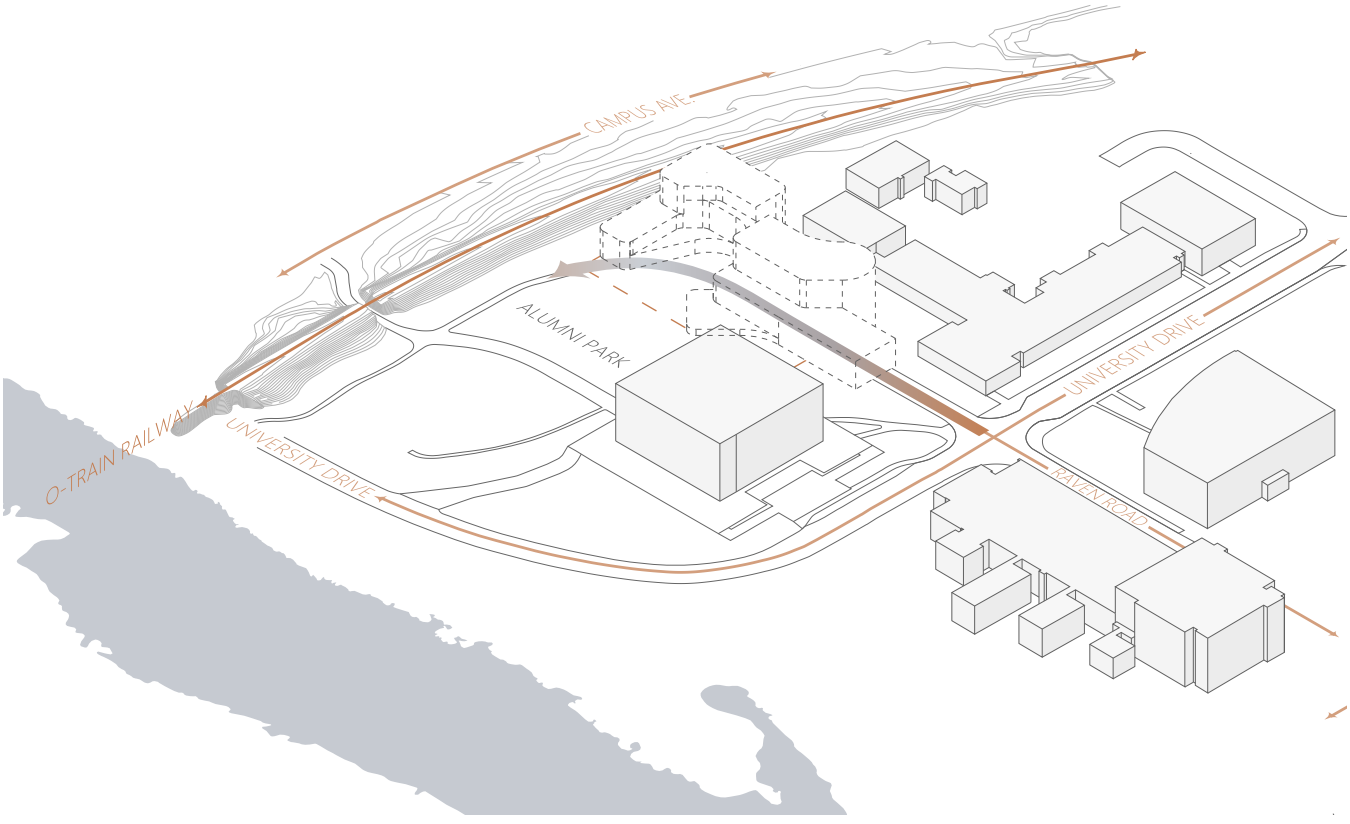

figure 53. Massing and Context

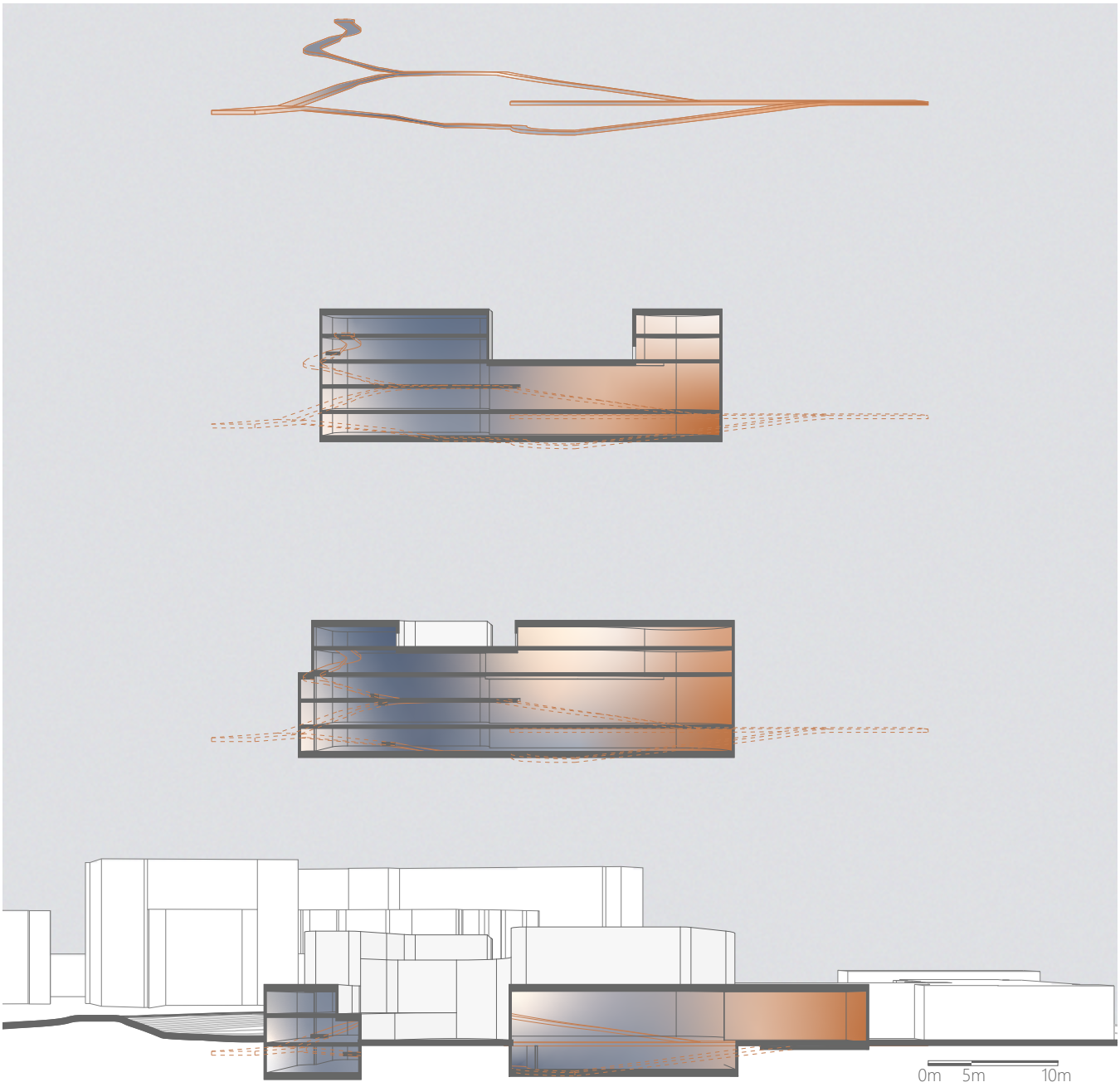

figure 54. Sections

To inhabit *The Neuro-Sanctuary* is to journey from the urban realm at large toward the nexus of the campus. The path bifurcates at points where the division between the hyper and hypo sensitive needs is strongest. A Courtyard acts as a centre point connecting both ends and intertwining them in a rich but tranquil sensory experience. Moving deeper into the building, stimulation becomes more limited but deliberate. The journey takes the student along a ramp where overlooks are paired with nooks and discreet spaces for hiding, allowing visitors to anticipate the atmosphere ahead and, to identify a space of hiding, if one is required. The design crafts *The Neuro-Sanctuary* according to a spectrum, in an attempt to welcome, and to reflect, the boundless diversity of sensory experience. The journey through *The Neuro-Sanctuary* is intended to be a celebration of the senses and to instill feelings of peace and refuge.

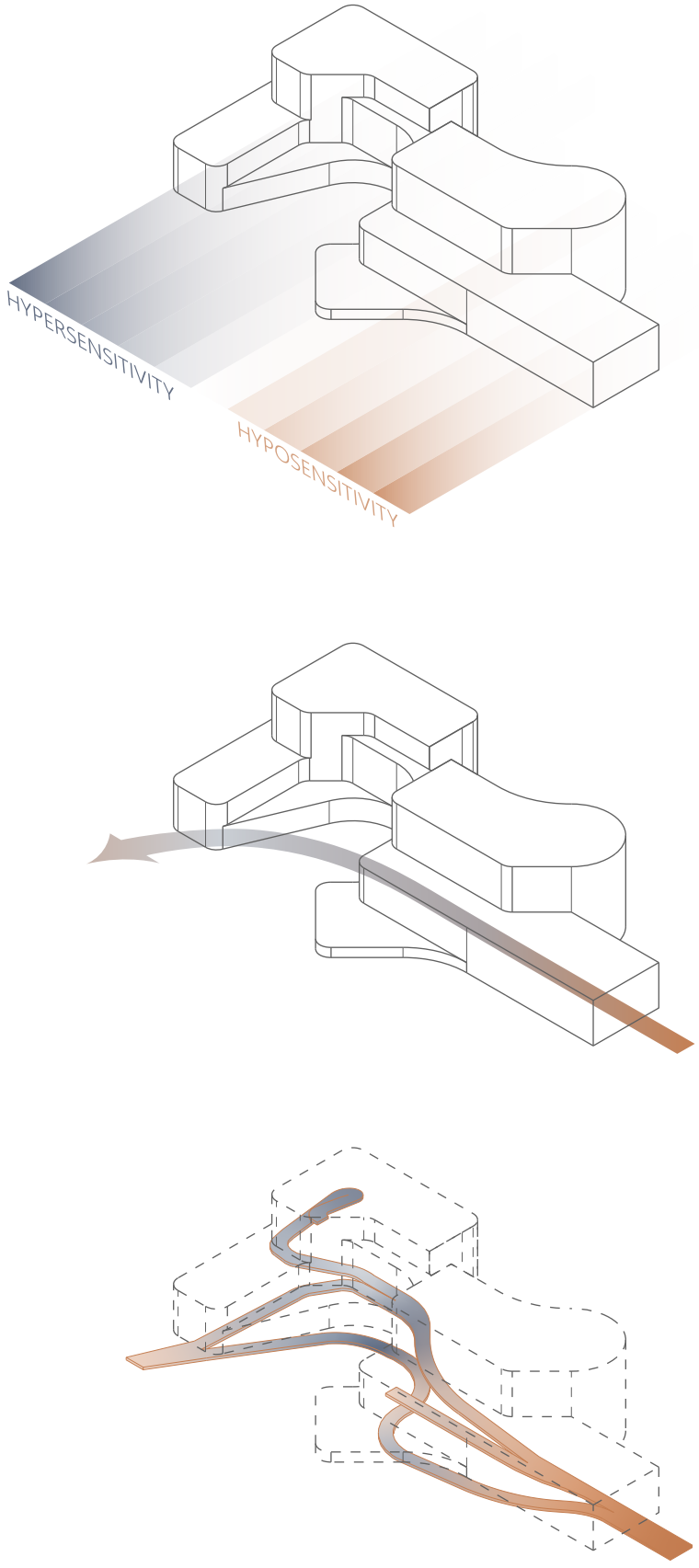

figure 55. Conceptual Diagrams: The Spectrum and The Massing

The form of the building exemplifies this balance between conditions of exposure and protection. In very simple terms, the building is comprised of a series of convex and concave masses along a linear path, intersected by a rhythmic structural frame. The mass is in some places concave, where spatial moments are carved out to envelop the visitor in a comforting environment. One such concave space is the exterior courtyard that establishes a reciprocal relationship with Alumni Park and the public realm. On an upper level, a sensory garden inhabits a more private concavity. Here, both the higher level and proximity to the neighbouring Maintenance Building reinforce a sense of privacy for the space. The two exterior spaces – the courtyard and the sensory garden represent a design concept which is reinforced again and again, creating a form which provides for both inward and outward spaces.

The choice of curves and soft forms is an intentional move to decrease any intimidation. Sharp angles and straight lines can often be visually overwhelming, and even feel threatening to some individuals. Additionally, long corridors and dead-end spaces are difficult to visually comprehend and usually create dark corners and daunting spaces. In an effort to overcome this, the architecture of *The Neuro-Sanctuary* incorporates curves, providing a smoother and less visually cluttered environment. Rounded spaces are often associated with comfort and coziness, producing more inviting and relaxing atmospheres. At the principal access points, the architecture does adopt a more orthogonal form. A rectangular shape extends outwardly from the building's eastern façade to meet the intersection of University Drive and Raven Road. This incorporation of more "box-like" architecture form is an intentional move through which *The Neuro-Sanctuary* can correspond to the design of its surrounding context.

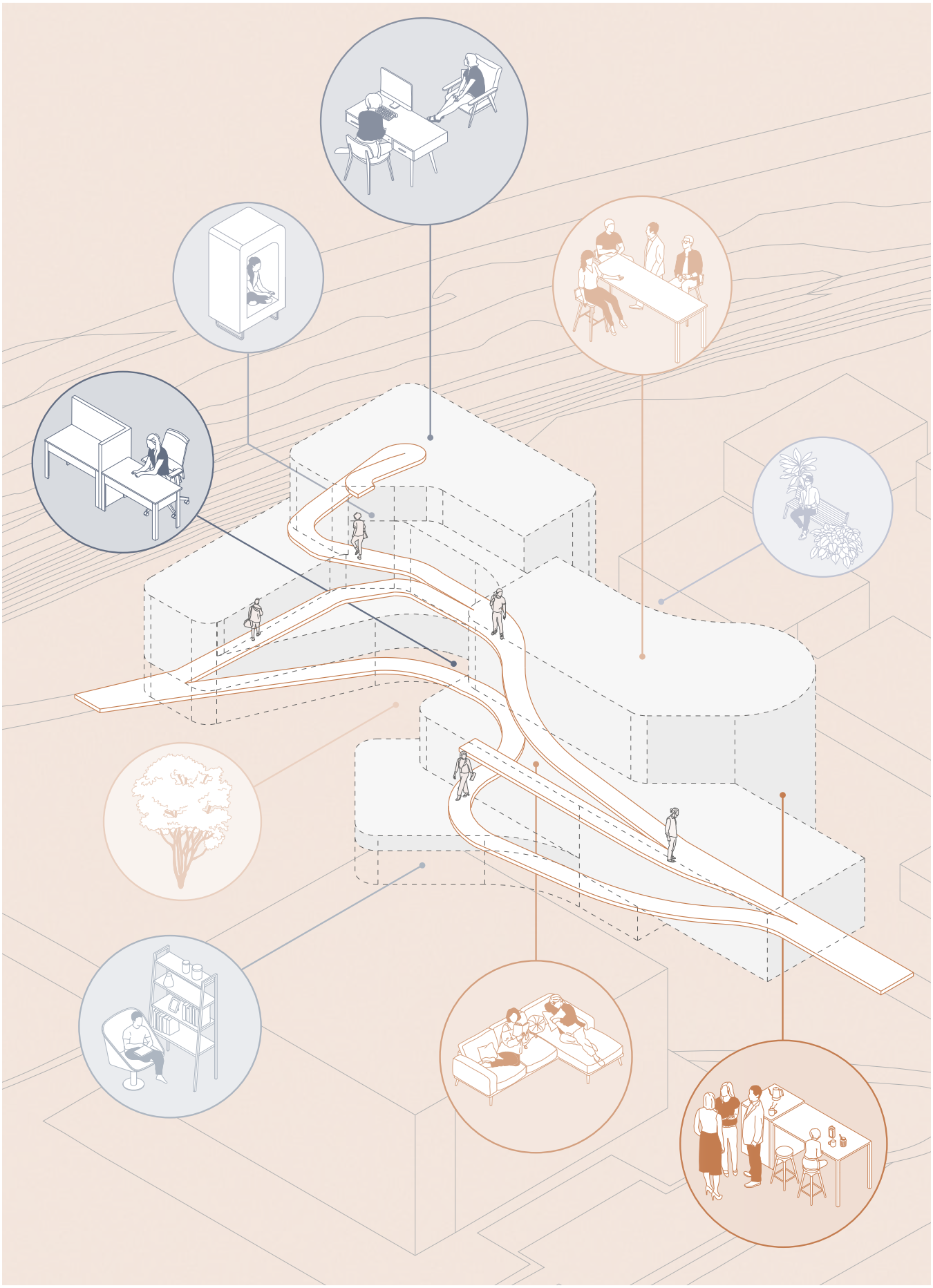

figure 56. Axonometric Diagram: How the Ramp moves through the Program

figure 57. Plaster and Wood Model - The main walking path

The design ideas for *The Neuro-Sanctuary* are illustrated in "partial" drawings and models which form a set. A plaster and wood massing model; plaster casts of small spaces; digital analytical axonometric drawings (one, a complete massing, and another, exploded); digital diagrams that isolate the ramp; hand-drawn charcoal-on-paper perspectival vignettes; the representations complete each other. Analysis and atmospheres: one picks up where the other ends.

The plaster and wood model presented in the following images is a conceptual model representing the balance between the more open and communal spaces and the more intimate and secluded ones within *The Neuro-Sanctuary*. The plaster masses represent the more intimate spaces protected from the outside world within a steady and solid structure. Extending past the plaster masses, the model's wood frame defines zones in which interior and exterior come together. These welcome communal rooms where connections can be cultivated.

figure 58. Plaster and Wood Model - The massing from University Dr.

figure 59. Plaster and Wood Model - The massing meets Alumni Park

figure 60. Plaster and Wood Model - The massing from the pedestrian tunnel

figure 61. Plaster and Wood Model - The Massing from the maintenance building

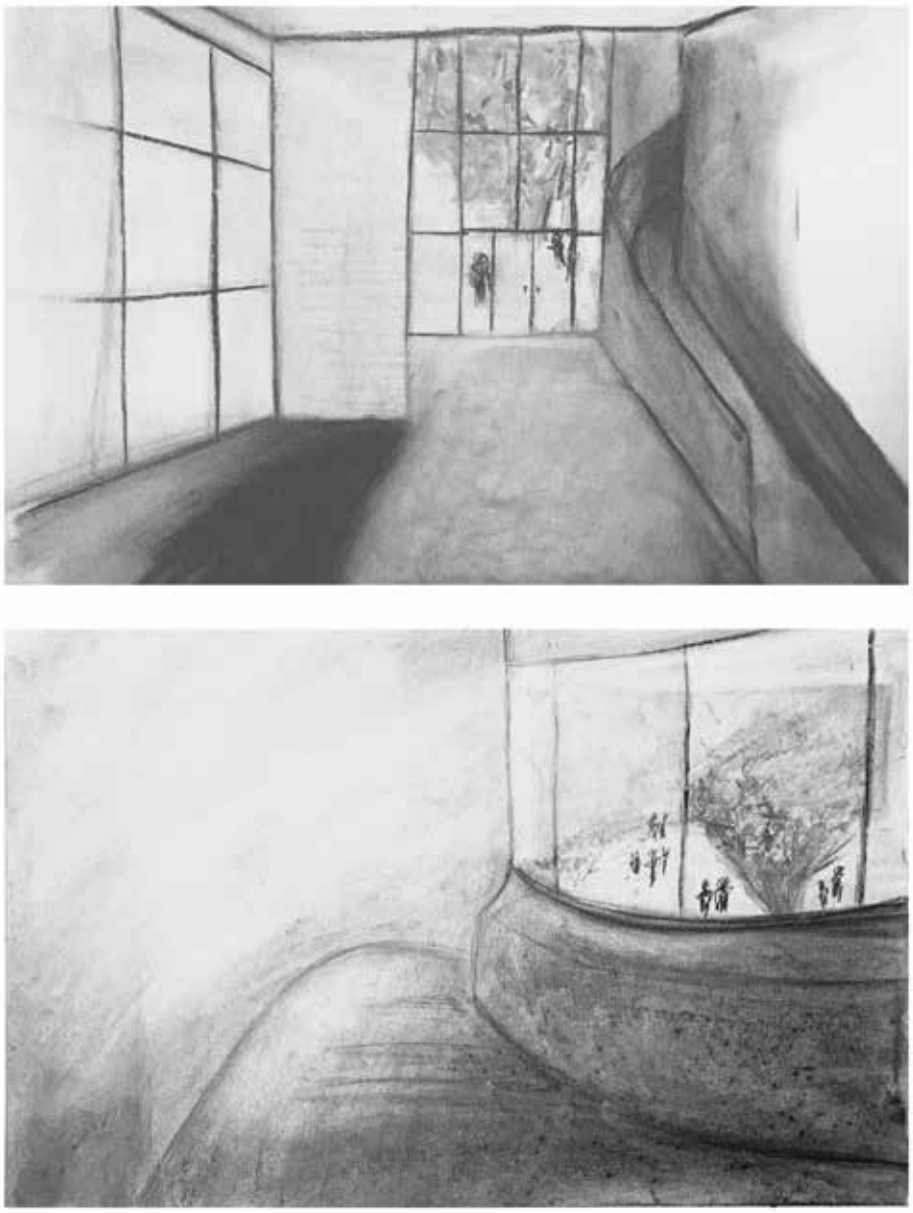

figure 62. Preliminary Vignettes - Charcoal Sketches

figure 63. Preliminary Vignettes - Charcoal Sketches

Endnotes

1 T. Editors of Encyclopaedia Britannica, *sanctuary*. (Encyclopedia Britannica, 2023, https://www.britannica.com/topic/sanctuary-religion).

2 Meredith L Miller, "Seals, Joints, Seams, Leaks: Detailing the Architecture of Sanctuary." In *Journal of architectural education (1984) 68*, (no. 1 (2014): 82–93), 82.

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7 About Carleton, *Facts and Figures*, (https://carleton.ca/about/facts/).

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11 Carleton University Steering Committee et al., *Carleton University Campus Master Plan Update 2023*. (Carleton University. 2023), 136.

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13 Ceridwen Owen et al., *Supporting Students with Autism Spectrum Disorder in Higher Education*, (University of Tasmania. https://www.ncsehe.edu.au/wp-content/uploads/2016/03/Supporting-Students-with-Autism-Spectrum-Disorder-in-Higher-Education.pdf).

Chapter 5

Traversing the Spectrum

This proposal embraces the spectrum of sensory sensitivity – reframing architecture to be understood not as a static entity but as an adaptable environment. The design orchestrates a series of sequential sensory experiences well-suited to a variety of preferences and needs. As an architectural device, the ramp organizes the building and cues all the experiences and spaces the visitor will encounter. Working around the notion of the ramp is intentional as the ramp is an architectural element which empathetically tips the floor in the direction of circulation. Unlike a staircase, which imposes a structured ascent or descent, the ramp incorporates more natural navigation. It allows for movement in a fluid unhurried manner, adapting to the pace and rhythm of its traveler. This is a comforting and reassuring gesture on the part of the building, one that is especially important for the neuro-sensitive individual for whom reassurance and a sense of groundedness are crucial. The drawings represent the journey through the sensory realms – addressing both hyposensitivity and hypersensitivity.

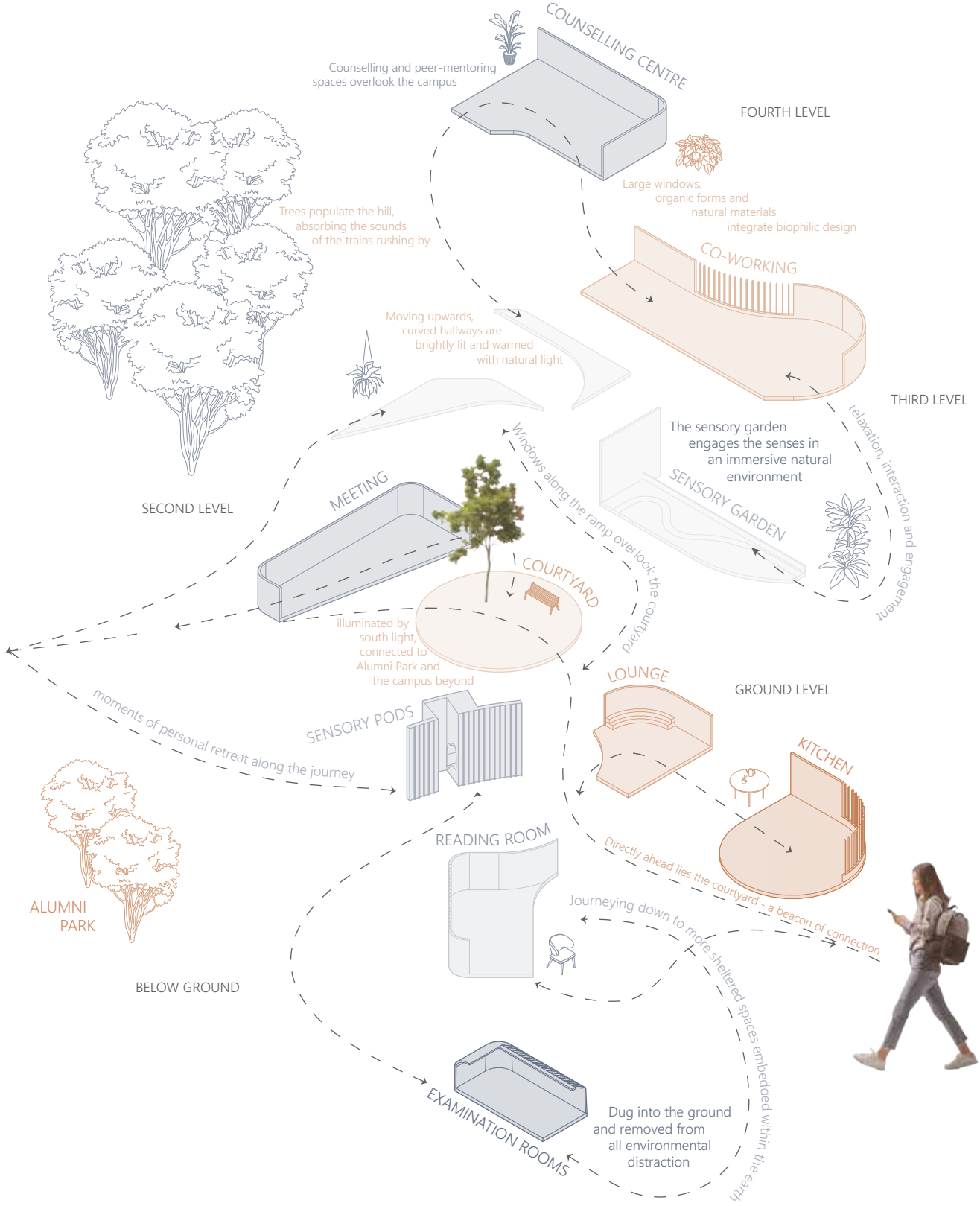

figure 64. The Jouney through The Neuro-Sanctuary

The extruded diagram (figure 62) explores the uniqueness of each spatial moment, showcasing how the sinuous ramps weaves them into a harmonious journey. Beginning at the main entrance on the East façade – the intersection of Raven Road and University Drive - the journey unfolds along this ramp, graciously guiding visitors into the narrative of the sensorial spectrum. Each turn of the ramp unveils new vistas, offering glimpses into the spaces throughout the building and instilling a sense of anticipation for what lies ahead.

Upon entering, the visitor's gaze naturally gravitates to the inviting exterior courtyard beyond, which offers a beckoning oasis of tranquility and community. The latter is envisioned to be the heart of the *Neuro-Sanctuary.* This courtyard is illuminated and warmed by southern light. The courtyard extends beyond the physical boundaries of the building, opening onto Alumni Park to become a place of connections while inscribing the new building within the broader campus context.

The ramp grows in several branches from the ground floor's main walking path. The first branch is a gradual descent towards more secluded subterranean spaces. As the ramp slopes downward, it opens into a semi-private reading room before descending further. This branch of the ramp lands in the examination space, strategically positioned at the building's lowest elevation. Here, the subdued ambiance and grounded atmosphere foster an environment conducive to concentration and introspection. The examination room is a sanctuary from the stressful hustle and bustle of campus life. The sensory experience here is characterized by noise reduction stability, visual comfort, privacy, and security; these features are intended to instill a sense of calm and reassurance, particularly beneficial during the rigors of the examination process. Emerging from the examination space, the ramp continues. It moves upwards again, returning to the public domain. The ramp gently guides visitors towards the ground floor's more communal setting, with, once again, extended views towards Alumni Park and the campus beyond.

The ramp's second branch ascends towards *Neuro-Sanctuary's* upper levels. Moving through collective spaces such as a kitchen and lounge, this upward branch leads from a more public realm to a semi-private one. The ascent guides students to upper-level meeting and tutoring areas, and co-working spaces in a variety of forms. The ascent culminates in the counselling centre. Conceived as sanctuaries of solace and support, these rooms offer views overlooking the campus and surroundings including the rail line, Bronson Avenue, and Rideau River. From this higher and more secluded position, individuals can gain perspective and forge deeper connections with the surrounding landscape.

The following pages explore four moments in the proposal: The Passage, The Overlook, The Eden, and the Descent. These passages are meant to illustrate the sensory experiences created as one moves through *The Neuro-Sanctuary* along the ramp. Each one explores one of the four features of neuro-inclusive design: intuitive order, visibility and previewing, biophilic integration and moments of shelter.

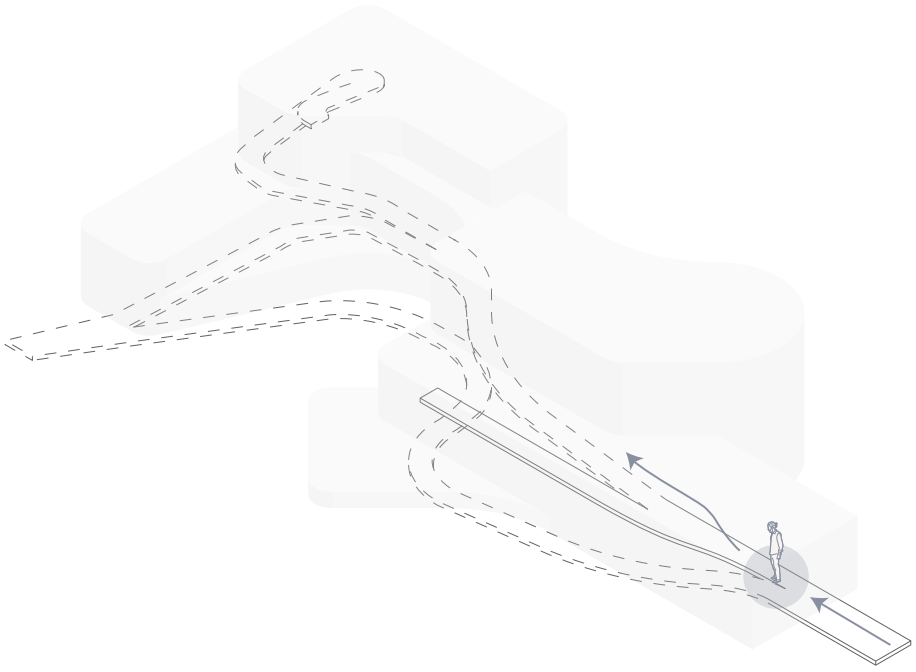

figure 65. Ramp at "The Passage"
(see fig. 69 for corresponding vignette)

The Passage:

From the main entrace, past the kitchen, to the lounge

The cool, solid concrete path transitions to a warm hardwood underfoot as I cross the threshold into the building's central foyer. With the doors' click behind me the rumbling of traffic moving across University Drive are muffled to a distant rumble, replaced by the multisensory experience of this interior world. My gaze is first drawn to what lies ahead of me. Directly opposite – though several meters ahead – glass doors reveal a captivating biophilic tableau. The courtyard beyond this threshold holds a large tree in its center, flanked by inviting wooden benches. The wooden path underfoot extends towards this courtyard, branching off at two points. At the first divergence, nearest to me now, the path ramps down before disappearing into unseen spaces below the earth. Moving along the central flat plan, an olfactory sensation suddenly envelops me, and I hear a beeping sound. My head turns to my right towards their source, and I visually investigate the first distinct space I have encountered: a kitchen -- bright and airy, buzzing with communal energy. A young man opens a microwave releasing burst of aromas that I identify as garlic and tomatoes. The beeping and whirring of various appliances intensify the auditory experience. Two girls lean against the counter with mugs in hand. Their voices are raised to be heard over the sound of the kettle boiling in front of them. This space includes a large high table designed for shared moments and lively discourse. Straying off the path, adjacent to the kitchen, is the gentler carpeted space of a lounge. I extend my hand and the softness of the cushions beneath my fingertips confirms what my eyes had predicted. After the ramp's hardwood floor, the lounge's carpeted floor muffles my footsteps. Here, the atmosphere has become cocooned; I enjoy a soft tranquility proffered by gentle furnishings and warm materials. Moving back to the central path the ramp ascends before curving to the left and disappearing from view: a second divergence.

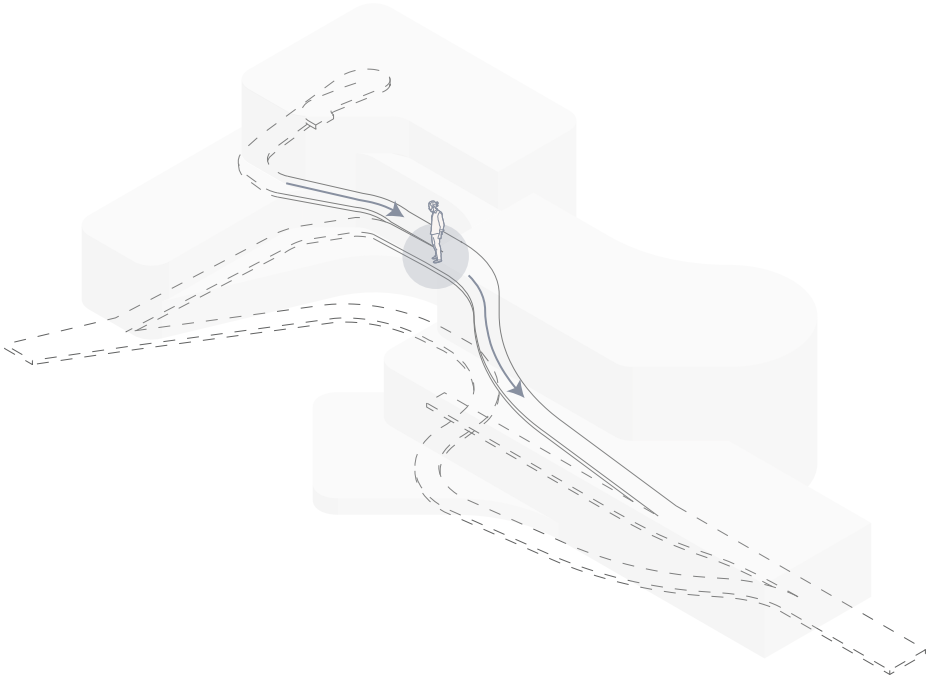

figure 66. Ramp at "The Overlook"
(see fig. 70 for corresponding vignette)

The Overlook:

At the midpoint of the ramp overlooking the courtyard

Moving down the ramp I approach a landing. My eyes take in the view through the large window running alongside the outer wall and framing the courtyard on the level below. Each step towards the opening shifts my perspective, slowly revealing an expansive panorama of the busy outdoor courtyard. My fingers graze the smooth, curved wooden surface of the parapet, the height of which instills a reassuring sense of security. Leaning against its sturdy form, I feel the sunlight over my face and the warmed wood beneath me. In this location, the ramp enshrouds me in a tranquil hush, offering a sense of solitude. This solitude is interrupted only on the rare occasion by the echoing footsteps informing me of another's presences pre-emptively and allowing me to mentally adjust before being confronted by the person. From my location I can survey the clusters of students engaged in animated conversation amidst the benches of the courtyard. Their gestures and expressions are visible though their words dissolve in the distance which separates us. Beyond the courtyard, Alumni Park stretches out to meet the Rideau River. The park is punctuated by a path along which the solitary figure of a young man meanders towards the pedestrian tunnel that passes beneath the rail line. I am suddenly aware of time and place, and I shift my focus to the watch on my wrist. I mentally calculate how long I have in this momentary haven before having to depart to immerse myself into the bustling academic core of the campus. Gripping the wooden parapet more tightly, I push myself away from the edge, turning away from the window. I slowly begin to walk again, continuing my journey down along the gentle ramp. With each step along the gentle incline of the hardwood ramp, the sound reverberates with the growing murmur of activity emanating from the spaces I am approaching. The anticipation for this communal environment is a reminder of my imminent return to the outside world.

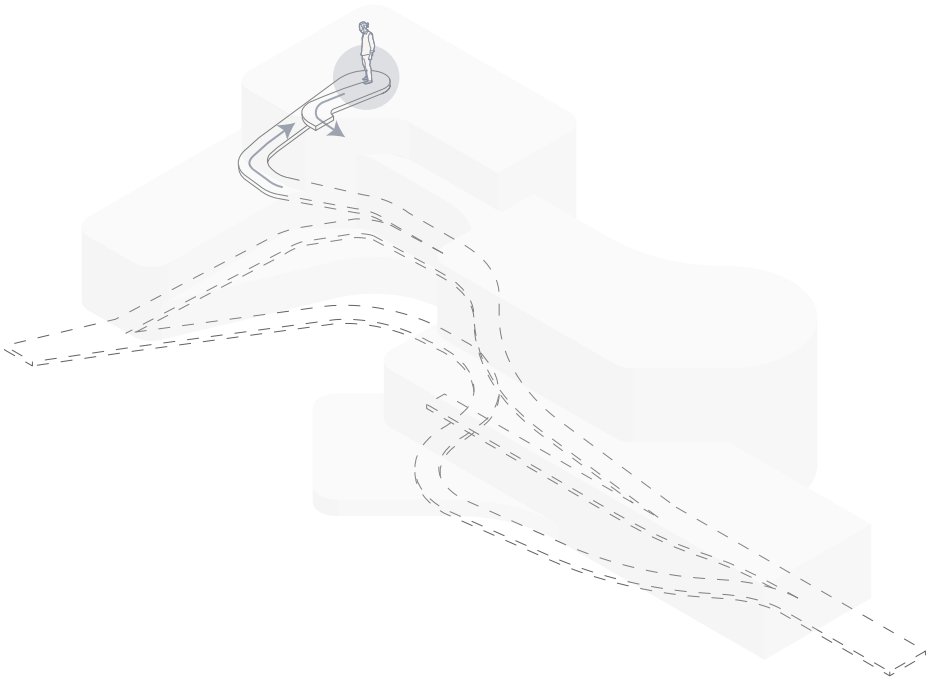

figure 67. Ramp at "The Eden"
(see fig. 71 for corresponding vignette)

The Eden:

Where the ramp becomes a garden

Looking ahead, the path before me gently tilts upwards, curving left before disappearing from view. I take small but deliberate steps along it, my mind buzzing with anticipation. My chest is tight with the anxieties of the outside world, and I feel the stress through the heat on my cheeks. Extending my arm to grip the railing I curve my fingers tightly around the rounded edge. The warmth of the wood reconnects me to my current environment. The path is quiet as from this level I can no longer hear the cacophony of chatter from the public spaces three floors below. I reach a landing and the ramp widens to incorporate a bench only big enough for one. Above me, there is a skylight, through which the afternoon sun streams with warm light. The bench wraps around me, enveloping me in its natural curvature. I lean back and feel the leaves of the hanging Ficus brush my cheek. The plants exude an earthy but fresh aroma. I take a deep breath and fill my lungs with the fragrant air before standing up again, propelled forward with a renewed motivation. The next leg of the ramp runs parallel to a wide railing in which a bed of lavender has been planted. The sunlight streaming in through the skylight nourishes the lavender as it does me. The soothing floral scent dances around me, calming me into a state of peace and quieting the anxious buzz in my brain. Continuing my ascent, the destination is growing near. As I reach the top of the ramp, the hardwood ramp flows into a honey-coloured linoleum floor that supports rounded meeting spaces. Stepping away from my reprieve, my environment transitions from the light botanical hallway to a more enclosed intimate space. Here, I step away from the light botanical enclave into the counselling centre's more enclosed and intimate environment.

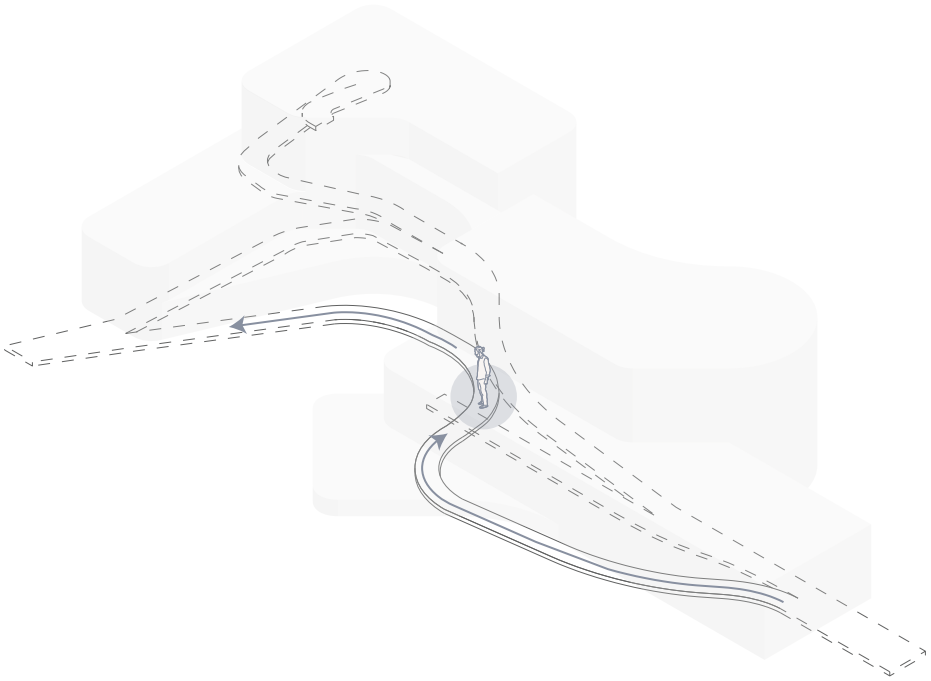

figure 68. Ramp at "The Descent"
(see fig. 72 for corresponding vignette)

The Descent:

The journey down through the reading and exam room

I diverge from the bustling noise reverberating from the kitchen and lounge, and my eyes register the long descending ramp ahead of me. As I begin this journey, each step along the gentle curved of the wood ramp demands a subtle adjustment, my body responding instinctively to the angle of the descending ramp becoming attuned to its subtle decline. The light seeping in through the large windows on the left bathes the adjacent white concrete in a comforting glow. My fingertips glide along the textured concrete wall, tracing the guide embedded within it: a reassuring tactile connection to my downward journey. As I progress, the walls on either side of the ramp grow taller almost cocooning me until I am fully separated from the hustle and bustle of the communal spaces I left behind. Though the sound of the crowd remains a distant murmur, its intensity dwindles with each step, reducing to a faint buzz. Above me, the windows diminish in size, the dwindling of natural light and warmth are tangible reminders of my descent. The path continues before me, veering right where the ramp's graceful curve entices me further into spaces of deeper quiet and seclusion. From my current vantage point, I can peer into a reading room. The ceiling in this space breaches through the earth's surface, inviting sunlight to dance in. These sunbeams exude warmth and beauty, and I feel drawn me into the embedded space. Resisting this pull, I follow the ramp as it descends further. My body registers its place below ground level and feels a sense of comfort and sanctuary. As I reach a level plane my inner orientation adjusts, and I move more naturally. The path continues on a level plane and the ceiling lowers, inviting me into an intimate room. Here, a ribbon of window caps the walls, allowing the light to dance in and warm the space. All that can be seen of the world outside are blades of tall grasses moving in the wind. The enveloping room exudes a sense of warmth and coziness. Individual writing tables are arranged along the wall beneath these windows. My fingertips graze the smooth wood desktop warmed by the sunlight. Sitting down at the desk my view of the rest of the room is obscured by a soft divider. Here, my only focus is on the surface in front of me. From this tranquil shelter, the cacophony of the world fades away. I can focus and concentrate and write my exam calmly.

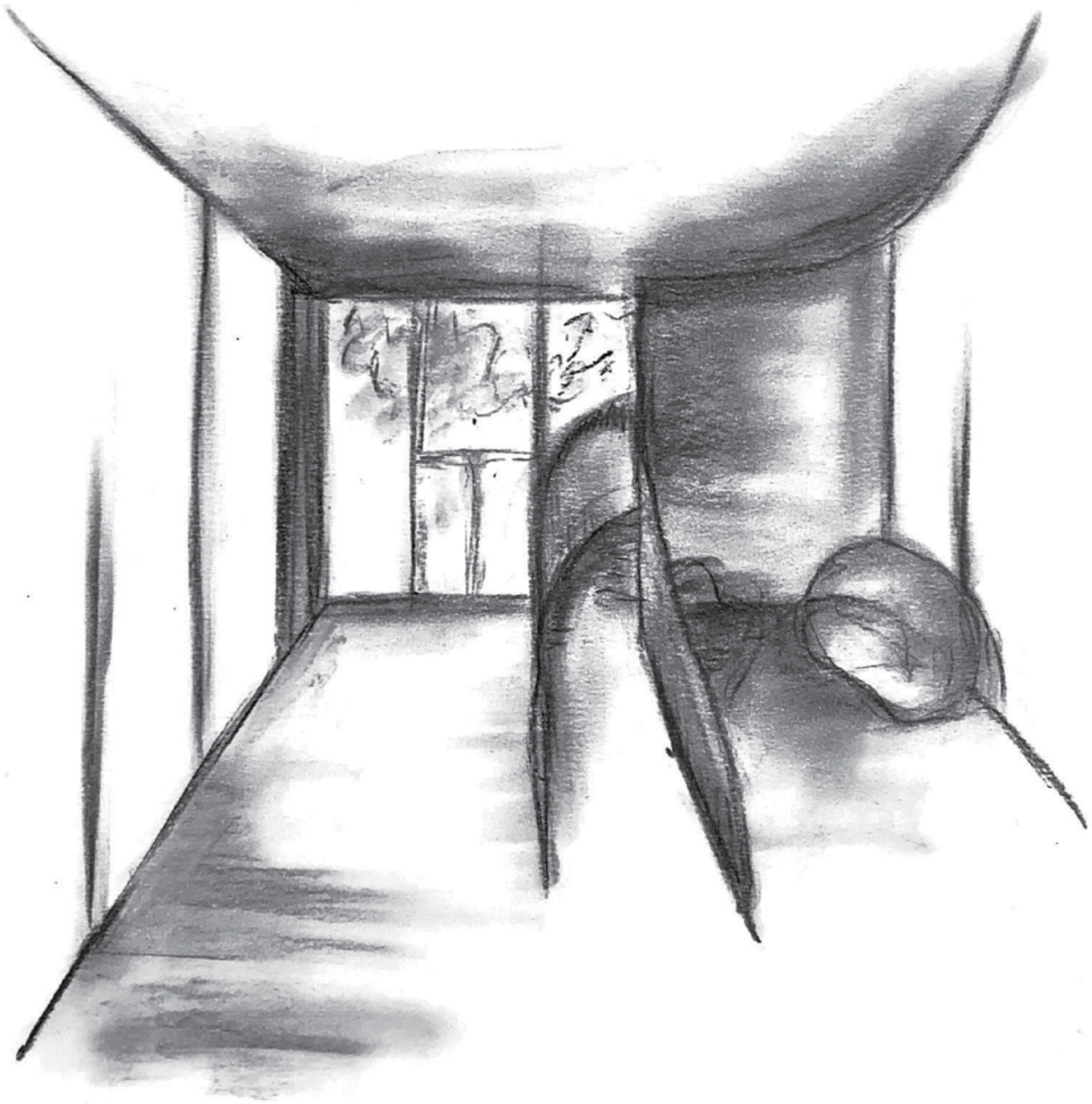

figure 69. Vignetter of "The Passage"

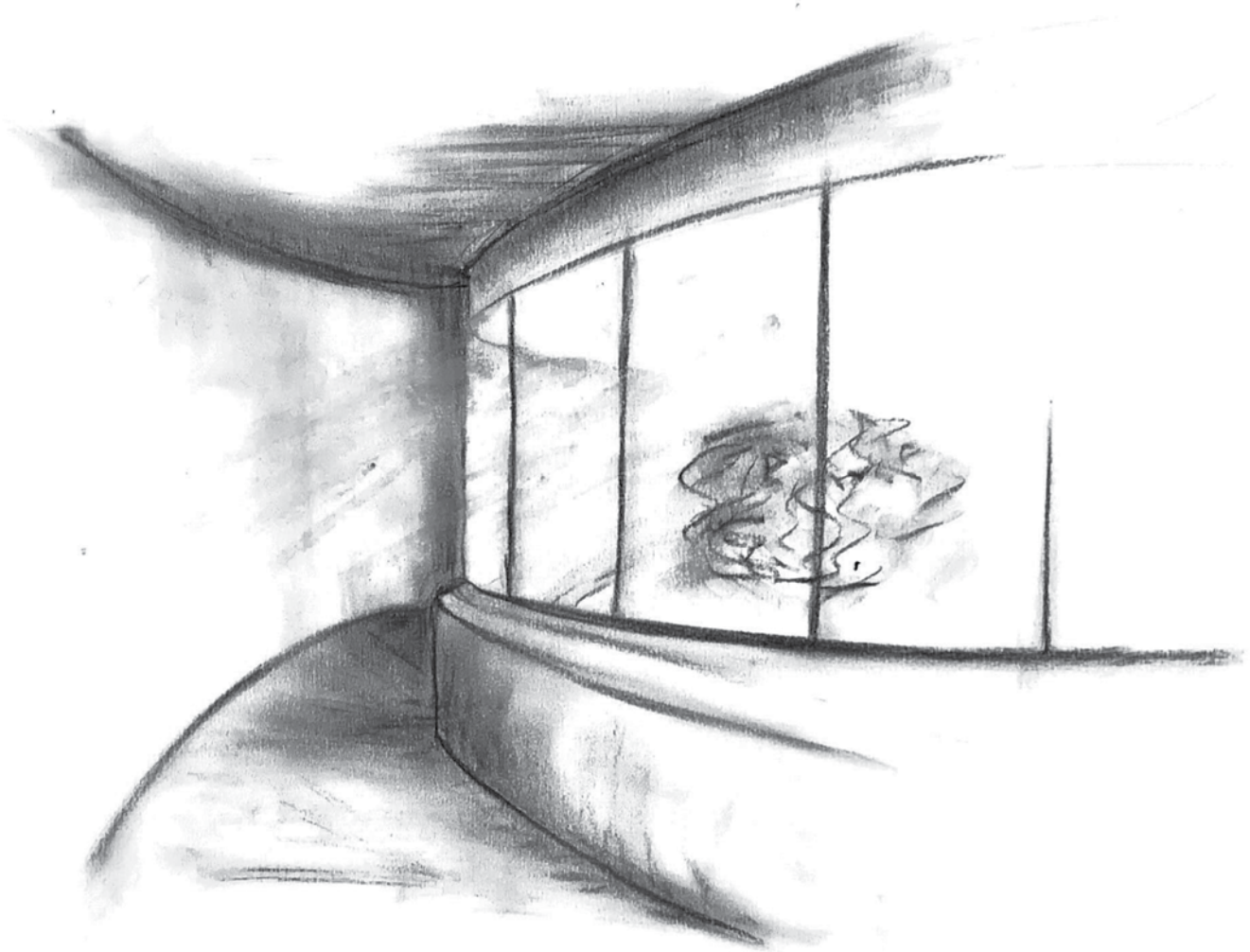

figure 70. Vignette of "The Overlook"

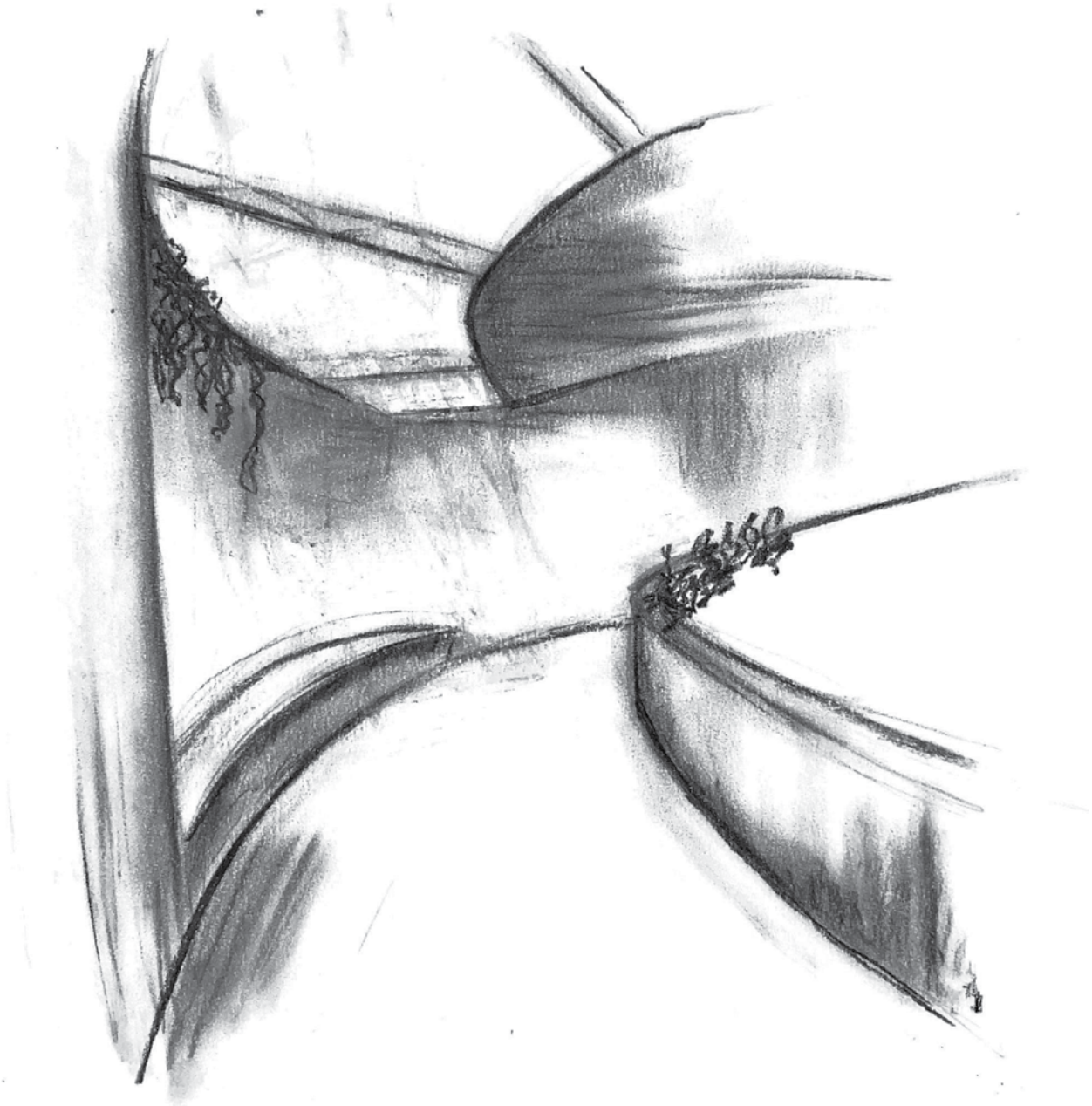

figure 71. Vignette of "The Eden"

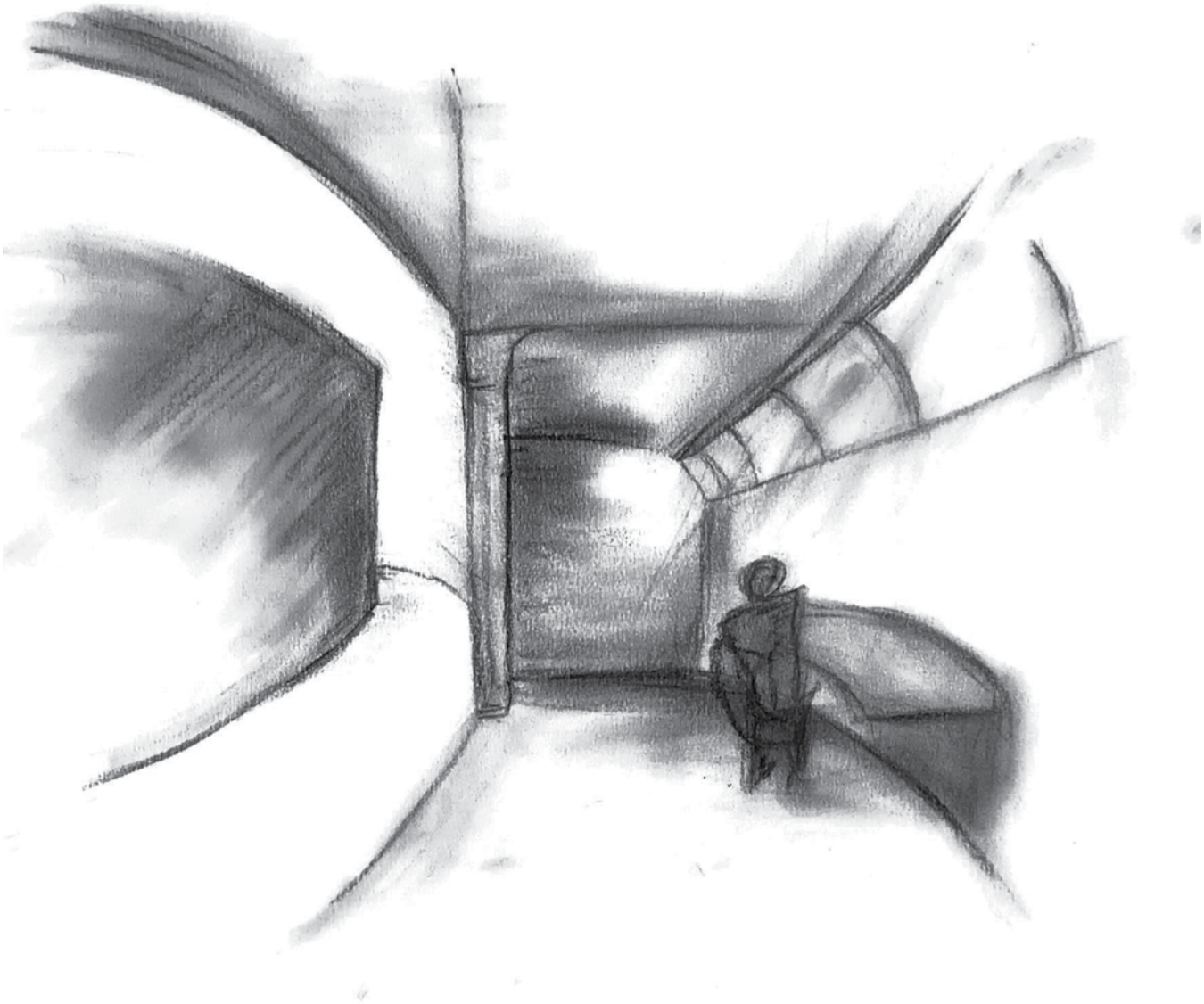

figure 72. Vignette of "The Descent"

Conclusion

The built environment affects every stage and almost every moment of our lives: we are born, nurtured, educated, work, create and sustain our relationships, and ultimately depart surrounded by it. Our greatest triumphs and loses, and many of our most profound experiences, are -- on some level -- affected by architecture. For neurodivergent individuals, the experience of physical life is often more acute. Thinking about architecture from the perspective of neurodivergence is to expand architectural thoughtfulness. While not always the case, the life of a building generally exceeds that of a person, and design choices are likely to impact a generation not even yet born. Without indulging a grandiose sense of self-importance, architects must recognize the responsibilities that comes with their position. Architectural practice necessitates an awareness of the vast spectrum of human experiences, including those of the neurodivergent community.

As argued in this thesis, "good" architecture is inherently accessible by all. Standardized design, however, ignores obstacles to access other than physical ones. Understanding that architecture is not merely visual but is experienced throughout the body provides a basis from which to explore the diverse sensory experiences of the neurodivergent community. Standardized design frequently limits the potential of architecture instead of augmenting it. Conversely, by embracing the diversity of human experience, designers can bring a new depth and dimension to their work and create a truly enriching and inclusive built environment.

The "spectrum methodology" presented in this thesis encompasses features of intuitive order, visibility and previewing, biophilic integration and moments of shelter to approach a vast spectrum of sensorial requirements in an improved manner in comparison to conventional campus design. On a greater scale the design proposition is reflective of the need for greater awareness and understanding of the neurodivergent experience. The thesis examined the "spectrum methodology" in the context of a university campus to underscore the need for a broader societal shift towards a recognition of diverse neurological needs in the post-secondary world.

The proposal for *The Neuro-Sanctuary* embodies a commitment to inclusivity, accessibility, and support for neurodivergent individuals within the community at Carleton University. As a hub of diversity, innovation and leadership, the university campus is not only a physical space but also should present a symbol of hope and progress. Moreover, the choice of Carleton University, an institution with a long history of accessibility initiatives situated in the nation's capital, asserts the pertinence design innovation for neurodivergence.

As identified earlier, a challenge in this undertaking has been the lack of research on the relationship between architecture and the neurodivergent experience. This gap offers an opportunity to the Carleton community: where better to erect a physical symbol of this evolving field of inquiry than on the very site which had been dedicated to research, education, and development? Meaningful inclusivity requires the involvement of the marginalized to understand and develop solutions to the barriers they face. Introducing a building onto the campus which welcomes the neurodivergent will offer the community both the opportunity and an expanded capacity to contribute to this development.

Neurodivergent individuals belong in higher education. Their presence brings challenges and questions for design. An important opportunity for the architectural field to evolve lies in the responses we develop to these challenges and questions. In essence, this thesis is intended to incite wider discussion of the relationship between neurodivergent experiences and architecture. The introduction of the spectrum approach acknowledges the challenges presented by such a diverse community and celebrates diversity using adaptive features and logical planning.

The features of neuro-inclusive design outlined in this thesis were founded on the limited research done thus far on the topic and influenced by the beneficial sensory design theories of architectural theorists such as Malnar and Vodvvarka, Erwine, Pallasmaa, and Lupton and

Lipps, who emphasize the importance of a holistic understanding of sensorial experience. Ongoing research exploring the intersection of architecture and neurodivergent perspectives holds promise for deeper understanding and appreciation. Such insights will prove beneficial for continuous refinement of neuro-inclusive design practices, thereby contributing to the creation of a more equitable and compassionate built environment. This thesis' proposal offers a tangible solution for the creation of inclusive architecture.

The design's embodied journey through the spectrum of neurodivergent experience seeks to redefine and transcend traditional notions of architectural accessibility. The proposal recognizes the nuances of sensory sensitivities amongst neurodivergent individuals. The architectural empathy embedded within this design acknowledges the diverse ways in which individuals interact with and experience their surroundings. Through careful consideration of sensory processing challenges and the integration of intuitive order, visibility and previewing, biophilic integration, and moments of shelter, the proposed spaces emerge as a sanctuary within the university campus. The ramp hosts a complex navigational journey, and acts as a unifying thread weaving together the rich and multifaceted aspects of sensory life. By centering the design around the ramp, the architecture is crafted into a structure that facilities movement while orchestrating a journey through various sensory realms. The design's emphasis on sensory experience not only addresses the practical needs of the neurodivergent community but also fosters a deeper sense of belonging and well-being within the built environment. As such, *The Neuro-Sanctuary* represents the power of architecture to foster empathy, understanding, and belonging, and advocates for environments that prioritize user-comfort, engagement, and accessibility for all individuals. This speculative campus building is a symbol of the transformative power of architecture in shaping more equitable communities.

In embracing every shade in the mosaic of neurological diversity, we can redefine boundaries and illuminate ideas yet unarticulated. Those who perceive the world through different hues have the potential to expand possibilities of design in ways we have yet to understand. New discoveries hold tremendous potential for architectural translation. With their guidance, the next generation of buildings will support the diverse tapestry of human experience more fully than in the past.

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