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Sound, Shape, Space : The Ontology of Space in Architecture

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SOUND | SHAPE | SPACE

THE ONTOLOGY OF SPACE IN ARCHITECTURE

by

Sean W. Robbins

B.Arch.Sci, Ryerson University, 2008

A design research thesis,
presented to Ryerson University

In partial fulfillment of the
requirements for the degree of
Master of Architecture
in the Program of
The Department of Architectural Science

Toronto, Ontario, Canada, 2013
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SOUND | SHAPE | SPACE

Sean W. Robbins
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Master of Architecture 2013

Abstract

This work embarks on a radically different understanding of space that sheds its preconceived physical attributes. Borne from a criticism of the imbalanced approach to architectural design, which focuses on 'form', the aim is to redeem 'space' as the inextricably linked partner of form in the design process. Herein, space is re-framed in an ontological manner as it relates to architecture, that is, as having to do with 'being'. To accomplish this, sound becomes

pivotal, constituting a catalyst in the reaction with form that brings ontological space to life within architecture. By using sound in reaction with form, the work will engage in the design of space in the ontological sense; as it relates to being, namely, that of human social practice. At its heart, this work is not really about sound or space, nor even architecture for that matter. It is about the way in which humans exist.

Acknowledgements

Foremost, this process would not have been possible without the guidance and leadership of Colin Ripley, my thesis supervisor. The simple yet audacious “what if” questions often lead to unexplored territories and exciting sonic excursions to places I never would have gone myself. For quelling my delusions of imminent failure by re-framing them as necessary touchstones of the murky and exciting design research process. For truly challenging the way that I think about the world around me, and for also — no pun intended — giving me space.

As one interested in the ontology of time, I must thank my second reader, John Cirka, giving up enough of his own for it to have significant meaning in my thesis. Many a conversation regarding the nuances of time and space, sound and matter were had; conversations that I hope can continue

informally into the future (if there is such a thing as ‘the future’).

For opening the breadth and width of my research process I must also thank Paul Floerke, whose instigations of the meaning of sound and silence proved of the utmost importance as the scaffold on which to structure my thought process.

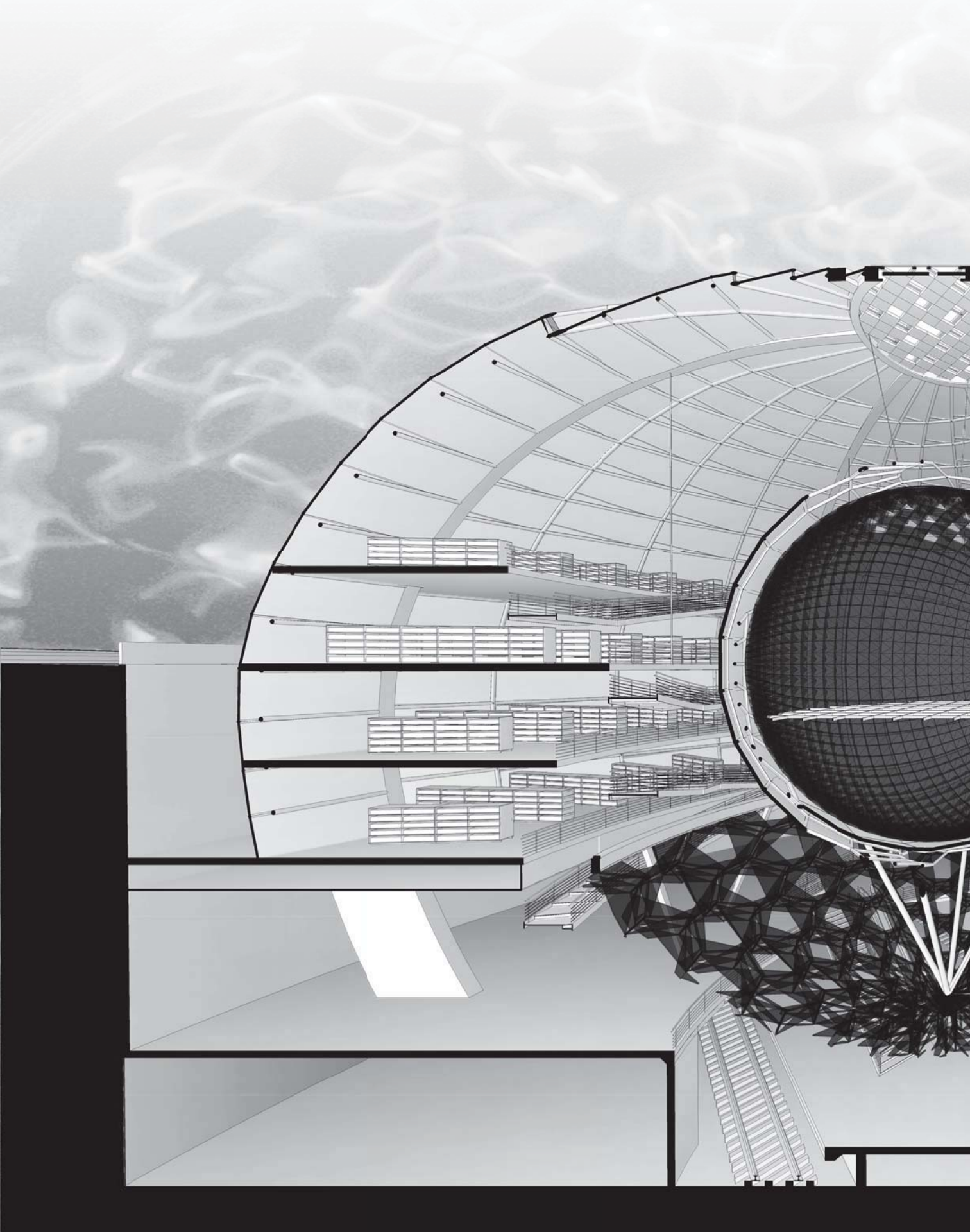
To the many other professors with whom I had the pleasure of crossing paths I must also thank for adding to the holistically positive experience that was my time at Ryerson University. This school is a truly attractive place to explore architecture.

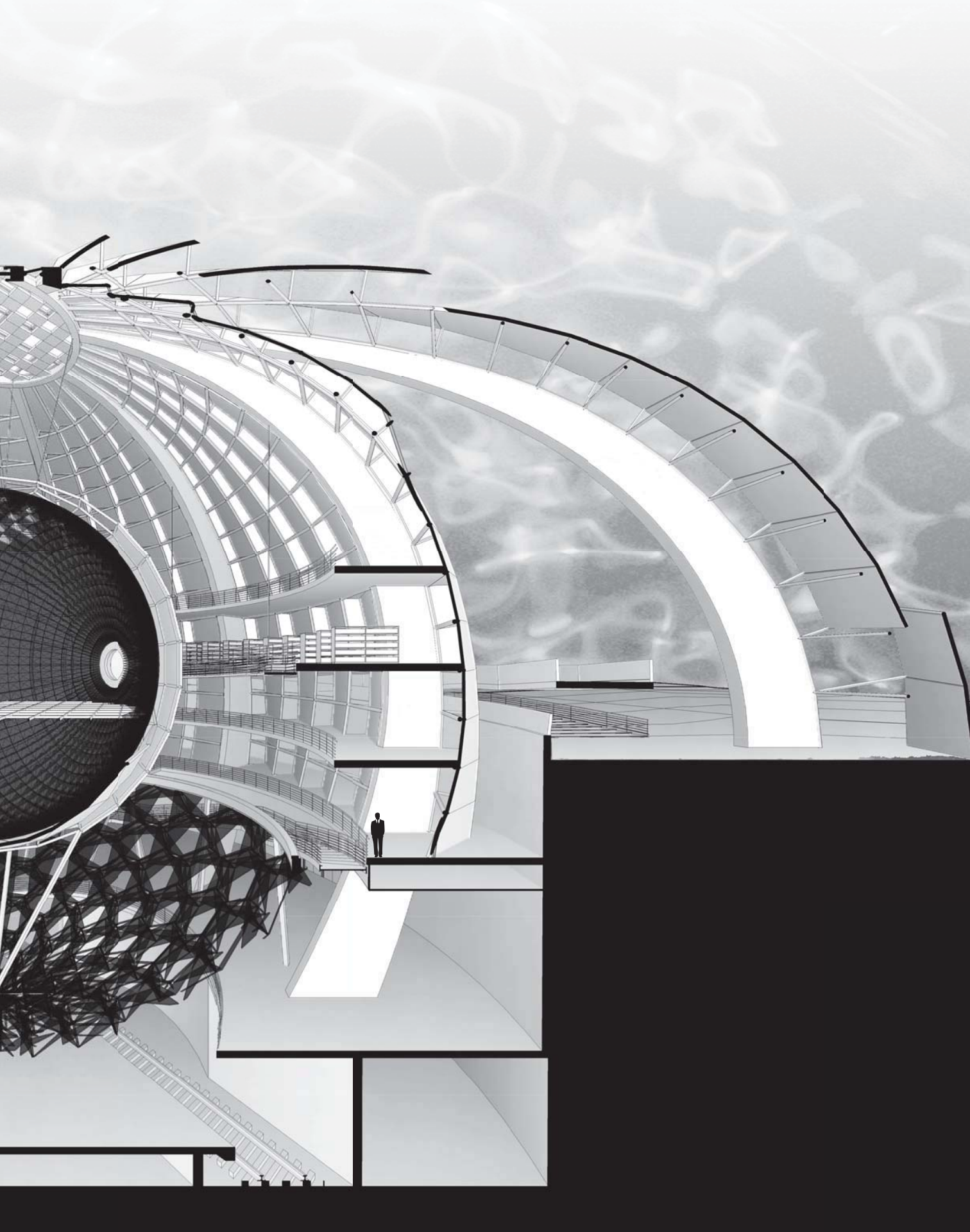
Lastly, the love and support of my family, friends and colleagues; for their understanding (or patient misunderstanding as I fumbled through my thoughts) and their willingness to both challenge and see me through to the finish.

To my mother, whose voice I first did hear.

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PROLOGUE

Nada Brahma "The universe is sound."

– Ancient Sanskrit Chant

THE PROEMIAL QUESTION

What is space? This is not something we often ask ourselves on a daily basis, but it is a question that we are constantly answering, all the time, every second, whether we realize it or not. Before we continue any further in addressing the ramifications of this simple question and statement, it must be ensured that we are on the same page when speaking of certain things. Over the course of this architectural exploration some seemingly heretical ideas concerning the definitions of form and space have been distilled, and as a result the terminology must be clarified for legibility's sake. For instance, what do you envision when asked, "What is space?" How do you refer to it in everyday interactions and conversations? How might you refer to it architecturally? Likely, differing conclusions will be drawn when pondering these questions, and therein can be found

the impetus for this work: to share an understanding of architectural space while addressing the most important question of all: Is this even relevant? Assuredly, the answer to the question is an emphatic "yes" when it comes to architecture. The remainder of this written and visual work will be a humble attempt to make good on that assurance.

The way that we think about space as architects is of critical importance, because it engenders a particularly powerful response to the way we approach the design of buildings; a response which is currently lacking. One may even say that the addition of this spatial nuance to the already well-established *modus operandi* of formal architectural conception is the missing half of its fragmented whole. But it all depends on our frames of reference. For those of us

already deeply engaged in praxis, which itself functions on a slightly different set of rules and schedules than disciplinary engagements, this discussion may feel unnecessary and cumbersome to the way things operate. For others, embedded in architectural theory and discipline, it may seem downright redundant. Why dredge up discussions of space? Is it not self-explanatory? Architecture is about creating form, and is not space simply a by-product; the ‘stuff’ left over when architects conceive of form? Although this may be true in one sense, it could not be further from the truth in another. Questions concerning space are of the utmost relevance to all strata of architecture, equally so to those questions concerning form. However, in the context of the discussion of this work, it is crucial that what is meant by ‘form’ and ‘space’ is each explicitly understood, because as will be shown, they may be somewhat contrary to our long held preconceptions.

Through research, readings, discussions with colleagues (and generally anyone who would lend an ear), it grew clearer over time that the word ‘space’ had become embroiled in a metaphorical scandal of sorts. In every instance, the question would have to be posed or answered: “Wait, what do you mean by ‘space’?” It turns out that ‘space’ is a very convenient metaphor for understanding the world around us.

The term so readily useful in fact that while providing a powerful operative metaphor, it has simultaneously lost its own meaning altogether through sheer ubiquity. Much of this written work will be dedicated to a radical re-conception of what ‘space’ even means and how it is to be understood. The goal will be to establish a more attuned understanding of space, because as hinted at previously, it is inextricably linked with form in a way that is often overlooked, relegated or sadly misunderstood in architectural design. But before saying any more on space, first what is meant by ‘form’ must be elucidated so that, in a manner, an understanding can be fashioned as to what space is *not*.

FORM VS. SPACE

Form is stuff. It is matter. Typically, when we think of buildings we would say that they have form; they are material. When conceiving and designing buildings, that is, performing acts of architecture, we also typically think in formal and material terms. We are concerned with light and shadow, shape, scale, and other formal aspects that we can see with our eyes. Form, strictly speaking, is only ever understood visually. It is important to distinguish that light is the interpreter of form, as Le Corbusier famously proclaimed: “Architecture is the masterly, correct and magnificent play of masses brought together in light. Our

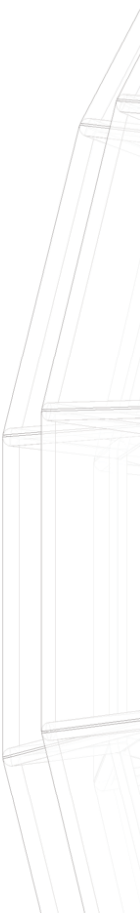
eyes are made to see forms in light...”¹ It is crucial that this distinction be weighed, because it sets up the basis for what space is not, which in turn will assist in determining what it *is*. Oftentimes, space is misconstrued with form, or rather as having formal qualities. For instance, we might be standing in a room lit with natural light, our backs against one wall, looking toward the other some distance away. Someone might ask us to describe the ‘space’, to which we may reply: “That’s simple! It is between us and the far wall. A distance of about ten steps.” It may seem obvious that this distance and the openness between us and the walls should be described as space, but this would be incorrect. In actual fact, this would be describing the vectors associated with the form of the room; the length of floor between us and the opposing wall. The ‘space’ metaphor, which is readily applied as a kind of shorthand expression for understanding the physicality of the room, is actually describing its form, and not its space. To illustrate it further, if someone were to ask us to measure the volume of the room, conventionally its ‘space’, we might come up with some metrics to appease this query. For the sake of argument, we could say that the room’s volume was measured to be one-hundred cubic units. Triumphantly, we present our calculations, deeming that the room is indeed full of one-hundred

cubic units of space. But again, we would be incorrect. By measuring the void of the container we would still not have escaped a description that bears on ‘form’ or at the very least of matter. The form of the room is able to contain one-hundred cubic units of matter, in this case the gaseous compound referred to as air. Physical metrics describe physicality. This is the problem of trying to attribute them to space: because space is inherently and only ever metaphysical.

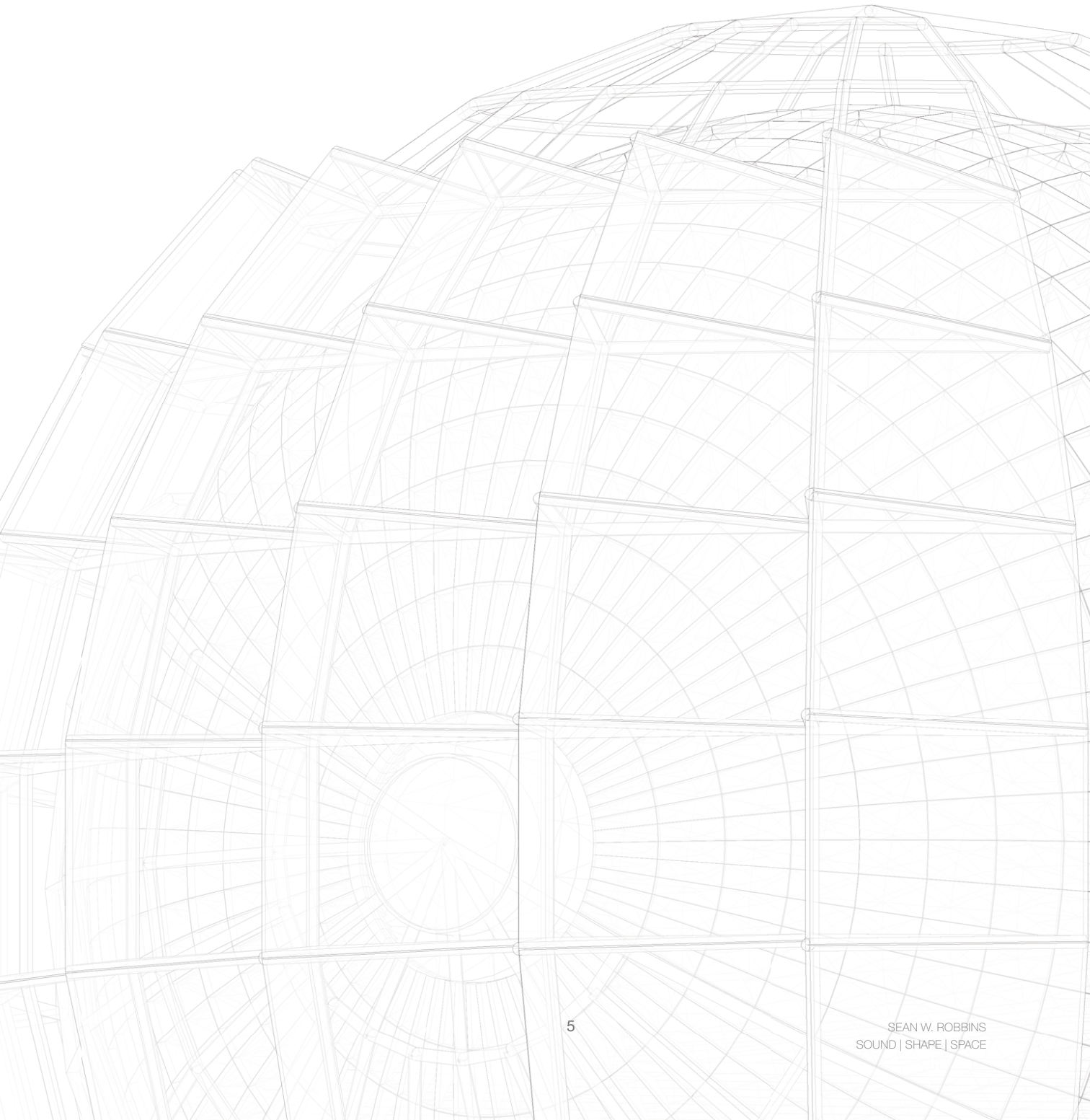
Space is nothing. It is *not* matter. In fact, it is a mentally constructed concept by which we understand the physical reality around us, but it is never physical. More: space is ontological. The goal of this thesis is to explicate this very idea; to explore the ontology of space, but in a uniquely sonic way. In a similar fashion that light is the interpreter of form, it could be said that *sound is the interpreter of space*. Sound is the *language* of space. This may not seem readily apparent, especially since the ubiquity of ‘space’ as a metaphorical descriptor of our physical and social realities has already begun to reconstitute the way we think about it, but it will be shown herein that space is purely understood through the medium of sound. The metaphor of ‘space’ can be seen in a vast array of (mis)usages: from social, political, cyber, and intimate spaces to cosmic, physical (i.e. Physics), geographic, and mathematic (Euclidean

and Cartesian) spaces. It would be reckless to negate these as critical metaphors for understanding our existence, however, it is important to continually be reminded that they are strictly signifiers that stand for physical realities and are not in themselves physical, nor sensuous outright, and therefore cannot truly be spatial by definition. Due to the prolific convenience of 'space' as a metaphor, its own definition has become obfuscated in its own plethora of meanings and is therefore confused as being a thing that can be sensuously perceived; that is, as the medium within which objects are contained. However, this is not the case; space can only ever be *conceived*. As an entity that cannot be sensed outright, space is never perceivable. The argument of this work is to posit that it is instead sound that is perceived, which then generates an array of possible conceptions of space. Sound shapes space. It is important to emphasize again that space is never physical, meaning that a statement like "sound shapes space," refers to sound as the instigative generator of mentally constructed concepts *qua* spaces, and not a form-finding method. Traditionally, and prolifically, space has been understood by the extension of the human body (*res extensa*, à la Descartes) as it moves and understands itself (*res cogitans*) as an object within...space. However, this widespread idea contains a furtive tautology

concerning the self-referential nature of using a spatial signifier (Euclidean or Cartesian space) as the substrate to understand the very thing (space). For this reason, and in order to return to the aforementioned 'radical' understanding of space, some effort will be made to extricate it from the current Cartesian/Euclidean understanding, particularly as applied to architecture. A push of seemingly sluggish inertia will be made to reformulate a spatial understanding that lies outside of space itself, which is formulated via the perception of sound. As will also be shown in this work, the perception of sound bears heavily on the *human mode of being*, or one may paraphrase: on the *human conception of space*. It will be argued that this very conception of space, which occurs at the behest of sound as it reacts with tectonic form, is also the very thing responsible for *how* we exist socially and individually in the world. The reformulation of this 'sono-spatial' ontology will form the corollary for an architectural excursus that explores these ideas tectonically, and ultimately spatially. This approach will be the logical route to readdress the 'quantum entanglement' of space and form in the most appropriate way; having pulled them apart as distinct, yet inextricably linked entities; as one, comprised of two. Herein resides the beauty of architecture: that it is the human expression of tectonic form



as the facilitator of conceptions of space,
which are subsequently the modes by which
humans exist individually and socially.







SOUND

Le silence éternel de ces espaces infinis m'effraie.

- Blaise Pascal, "Pensées"

SILENCE

Silence and quietude are markedly different things. In Western thought, silence is often attributed to death, or non-life. It could be said that all of human existence falls between the 'parentheses' of silence; the bookends of human life. This is evinced in various ways through the fields of physics, theology and also in social practice of the memorial of the deceased. In the Judeo-Christian tradition for example, the book of Genesis depicts the voice of God as that which ends silence and begins existence: "And God said..." A similar creation story also exists in Hinduism through the phrase "Nada Brahma," which translates as the voice or sound of Brahma, the god of creation, giving rise to the world's sustained existence. Similarly, women and men of science refer to the Big Bang as being responsible for the genesis of the universe

and subsequent life forms thereafter, inferring an end to some previous silence, as it were. At the other pole of existence, in death, we observe moments of silence, following the suggestion of journalist Edward George Honey (1855-1922), to respect and partake of a shared experience with those whose lives have fallen silent.¹ For us, silence is a very profound and frightening condition, a type of existential *mysterium tremendum* that has even contoured the way we think about space.

When Galileo's telescope first suggested the infinity of cosmological space, it elicited reactions like Pascal's (depicted in the quote above), which translates: "The eternal silence of these infinite spaces frightens me."² It is true that sound does not travel in the vacuous dark matter of space, but it is perhaps more

interesting that the quality of 'silence' was attributed to it by Pascal in the 17th Century, long before the discovery that it is sonically mute. To attribute space as being something silent should be taken a step further though, layering the two terms together more closely. Let us temporarily shed our notions of space as a physical thing (which will be discussed at length later, and hopefully held permanently) and reverse the chronology as to which term informs which. Pascal had originally layered a silent characteristic onto the notion of cosmological space, but we should instead layer characteristics of space, in the ontological sense, onto the notion of silence. We must begin with silence as the substrate to which concepts of space are then applied. This approach appeases the original order with which both theology and science concur, that silence comes first. This starting point aims a trajectory of thinking about 'space' which will aid in its development as a subjective, ontological concept. It will be shown that the ontology of space is forged through the perception of the very thing that gives silence its existence through antithesis: *sound*.

Silence itself is very much an ontological concept; it is the dance partner of space in this way. Unless one experiences a total loss of the sense of hearing, silence can never be truly experienced. As an indicator of death or non-life in Western thought, the

experience of silence is something terrifying to be avoided. For those of us that have the ability to sense sound, there is probably only one way that we can come close to the frightening experience of silence that Pascal attributed to the infinity of cosmological space. Canadian composer and sound researcher R. Murray Shafer recounts an experience like Pascal's, which illustrates this further: "When one stays for a while in an anechoic chamber – that is, a completely soundproof room – one feels a little of the same terror. One speaks and the sound seems to drop from one's lips to the floor. The ears strain to pick up evidence that there is still life in the world."³ When composer and music theorist, John Cage, entered such an anechoic chamber he made some interesting conclusions regarding silence as well. To his trained ear, Cage determined that there were in fact two different sounds present in the room, a high pitched one and a low pitched one. Upon describing them to the sound engineer, it was determined that the high pitch was the sound of his nervous system and the low pitch was the sound of blood flowing through his body.⁴ After this experience, Cage proffered: "There is no such thing as silence. Something is always happening that makes sound."⁵

This reminds us again of the ontological nature of silence, which becomes a kind of unattainable condition

outside of, but related to, existence. Silence becomes a relativistic descriptor that has no absolute; an idea that is very much open to subjective interpretation, affecting us existentially. In this way it is again very similar to space, itself an ontological descriptor of existence that is always interpreted and formulated subjectively. But silence is the first condition in the layering order of these two metaphysical concepts, as was discussed above. As the base substrate, silence becomes a platform for subjective conceptions of space to follow. It is here that the difference between silence and quietude can be brought back into the discussion, because the latter represents a foremost, yet relative, subjective interpretation of silence, which is often hard to distinguish. This is perhaps what inspired Edgar Allen Poe to write in *Al Aaraaf*: “Quiet we call ‘Silence’ – which is the merest word of all.” When Cage experienced this quietude, whose curve tends toward the infinite abyss of silence but never quite touches it, he also unwittingly formulated the conception of a spatial ontology linked to the acute lack of sound — and it is perhaps the most fundamental condition of the conception of space. The perception of quietude, or lack of sound, other than that of his body, generated a spatial conception so personally immediate that in Western thought it often evokes feelings of terror. By coming face-to-face

with the infinite nothingness of silence, he began to conceive of a very close, personally lonely and hence existentially terrible space; one that caused men like Pascal and Schafer to fearfully question the very evidence of life. Closeness to silence elicits a confining and oppressive personal space, that is, a subjective, ontological concept of space, which then affects the very way that we relate to our own existence. From this closest and most personal of positions, we can also branch out into the wider milieu of how the spectrum of sound, beginning with quietude, can affect the way that human beings relate to one another socially. When our conceived spaces begin to expand in scale and overlap, absorb or repel, like bubbles and foam or concentric waves in a pond — essentially when they interact — we begin to describe the complex and nuanced ways that human socialization actually occurs as an intersubjective overlap, from the most personally intimate to the most pandemonious.

PREGNANT WITH MEANING

For every human being, silence is broken in the womb. “The auditory system of the fetus is fully functional about twenty weeks after conception.”⁶ It is the sense of hearing that gives us our first awareness of being. Neuroscientist, Daniel J. Levitin, writes the following about our first aural

experiences in life:

You wake from a deep sleep and open your eyes. It's dark. The distant regular beating at the periphery of your hearing is still there. You rub your eyes with your hands, but you cannot make out any shapes or forms. Time passes, but how long? ...Then you hear a different but recognizable sound – an amorphous, moving, wiggly sound with fast beating, a pounding that you can feel in your feet. The sounds start and stop without definition. Gradually building up and dying down, they weave together with no clear beginnings or endings. The familiar sounds remain remote and muddled, as though you're listening underwater.⁷

This small description of the intrauterine state has some key aspects in it that should be pointed out. Foremost is that once non-life breaks forth into life, our first perception of it occurs at the behest of sound. It is our first, post-silence, existential articulator. The second important aspect is that this initial perception is characterized by a certain sense of *otherness*. Hearing is a receptive and dialogical sense; one that very quickly establishes a framework for sociability. The sounds being heard in the womb immediately reference an 'other' which is outside of it.

This is quite distinct from the sense of sight, one that does not occur until we leave the womb, thus having no semblance of any reference to an 'other' until we emerge into the blinding brightness of the world. But this sonic milieu, in and of itself, is not enough to truly form a relationship; it only acts as the scaffold from which such a connection can be made. Again, the key difference at this point is that hearing positions us receptively, in reference to some other, whereas vision acts as a post-referential verifier. Hearing establishes our first spatial perception in relation to an 'other,' while vision verifies what we already know to be true — that the other exists. Although, as Levitin describes above, that we engage in the hearing of various sounds compounded together, our first relationship cannot be made until we are able to distinguish those that have particular meaning versus those that simply comprise the noise of the aural environment.

According to the late otorhinolaryngologist and psycholinguist, Alfred Tomatis (1920-2001), communication is a process that begins in utero.⁸ In order for this to occur, the fetus must be able to make a distinction between simply hearing, and actively listening; what is also referred to as listening versus non-listening. German Philosopher, Peter Sloterdijk writes:

...there are impressive observations

showing that this early listening ability does not result in the fetus being passively at the mercy of the mother's sonic inner life, or of the water-filtered voices and noises of the outside world. Rather, the fetal ear already develops the ability to find its bearing in its ever-present, invasive sonic environment actively through independent, lively listening and non-listening.⁹

He goes on to cite Tomatis, who emphasizes continually that the womb would be unbearable were it not for the ability of the fetus to tune out large areas of noise so that it can tune *in* to those which carry relational meaning, such as the mother's own voice. "For the subject-to-be, only those sounds which tell it that it is being welcomed are themselves welcome."¹⁰ It is also important to note that the fetus does not selectively choose particular sounds from its intrauterine environment by filtering those with meaning from the whole. Rather it is characterized by the ability to non-listen, a skill at which adults are quite adept in reference to such sounds that might be deemed background or 'white-noise'. Our own ability to tune out bothersome noise presences begins in the womb, which are "hence 'posited' as uninformative or indifferent, and consequently excluded

from [our] waking perception."¹¹ Similarly, this active non-listening is paired with the act of conscious listening, which correlates meaning to those sounds that it expects will grant it a certain sense of enlivenment. This is the domain of neuroplastic development that the fetus undergoes in the womb, but further to this, as Sloterdijk points out, "[in] listening closely, the ears carry out the primal act of the self; all later instances of 'I can,' 'I want' or I come' by necessity follow on from this first manifestation of spontaneous liveliness."¹² Aside from being a stimulator of early neurological development, the sono-social home of the womb is the impetus for the sense of self thereafter. It is only in reference to an 'other' (to which an 'm' should be prefixed by now) and by communing with it that we gain a sense of our own existence and subjectivity; we are being forged into a social, relatable being with an individual persona, that can only develop because the 'other' is aurally accessible.

The type of communication present in the womb is not one that can be echoed equally between the two parties though. One is the receiver of sound, but cannot yet make sounds of its own and so its posture must be that of the listener. "Up to this point, hearing means an active anticipation of friendly messages."¹³ This 'anticipation of friendly messages' to which Sloterdijk speaks has a direct link to the type of communication or

message being intentionally put forth by the mother, one of a happy welcome — of equal anticipation. The form of communication is one of a shared intentionality in which the fetus and mother form an audio-vocal pact. This means that the intentions of the happy messages of welcome from the mother's voice are the very things that generate the intentional listening of them. In this way, the pre-subject is able to relate itself to something and begin its formation of self.

There is also physiology involved in this process that breaks the above discussion out of mere poetics. "Tomatis interpreted the mother's entire body as a musical instrument — albeit one that does not serve to play a piece to the listener, but rather brings about the original tuning of the ear."¹⁴ As it turns out the female skeletal structure is capable of transmitting high and extremely high frequencies through what would otherwise be a very blurred

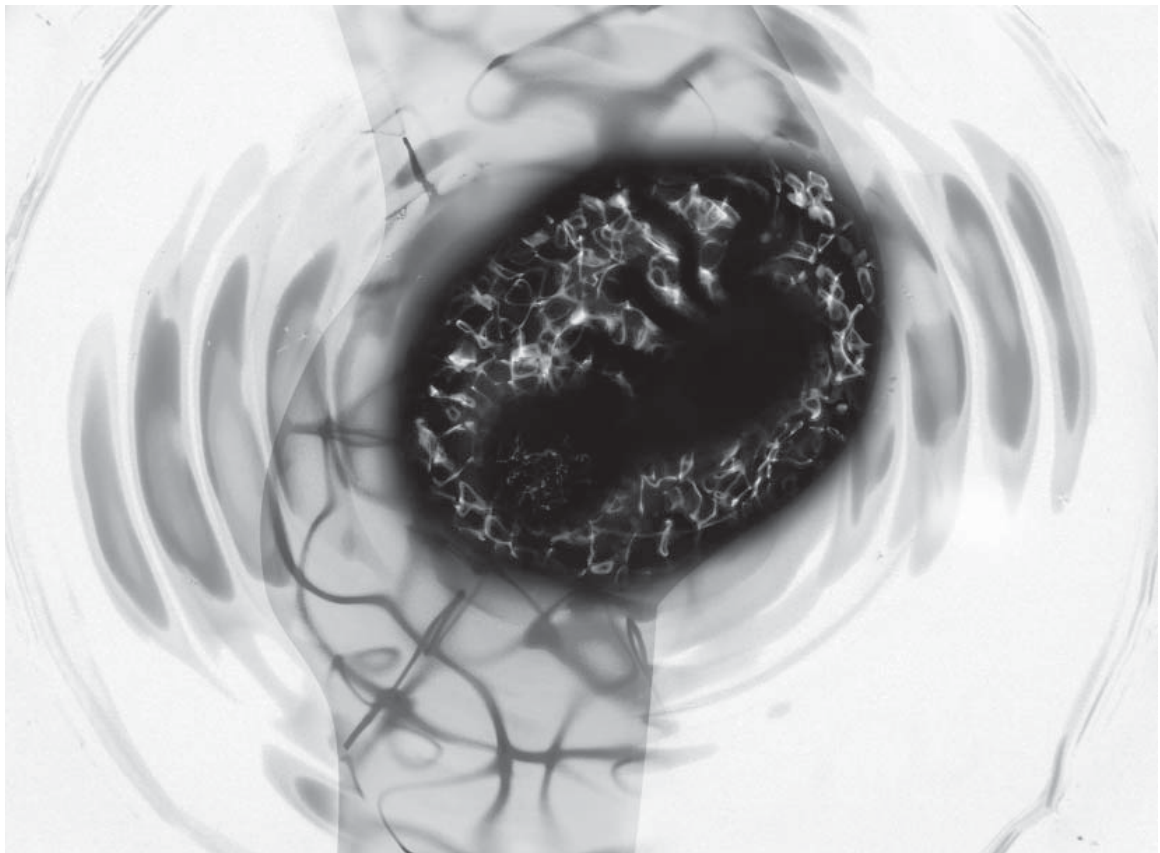


Figure 1. Author's depiction of the intrauterine sonic environment. A fetus is able to perceive sound at twenty weeks into gestation.

and bubbly sonic amalgam. The pelvis in particular, the only bone that differs between male and female skeletons, acts as a resonant delivery device that is capable of sending the subtlest of vocal frequencies directly to the place where the fetus rests its head. "This ear listens at the mother's pelvic floor and spine as a curious visitor listens at a door behind which he suspects delightful presents."¹⁵ Physiologically, the female body is set up to relay anticipatory sonic information to the fetus that bypasses the most accosting of womb-noises, directly communicating a sense of relationship that is then re-communicated through the act of anticipatory, active listening. The womb itself, our first plane of development and existence, is experienced sonically, socially and spatially; it is our first ontological conception of space.

To quell any arguments that the above discussion may not be the case; that there is really no possibility for a communicative relationship or cognizance of perception, as could perhaps be attested by the lack of adult memory of this condition, we can turn again to neurology. As discovered by Alexandra Lamont of Keele University in the UK, a fetus perceives music. This is particularly interesting for reasons of cultural affinity to certain musical styles, as well as for the formations of subjectivity and self beginning in utero, but it also suggests

something crucial and foremost: memory. Lamont's experiment was comprised of mothers who would play a single piece of music to their babies on a repetitive basis for the final three weeks of the gestation period. The amniotic fluid acted as a sonic filter in this case, akin to listening to something under water, but nonetheless the music was audible. Along with the other daily sounds such as conversations, environmental noises, as well as other music, one piece was singled out for each fetus to hear regularly. Upon birth, the piece was not played to the infant again for another year. After this delay, it was then played in conjunction with another piece of music of similar tempo and style (e.g. classical and classical) in order that a preference might be made on the basis of familiarity or affinity. To conduct the final portion of the experiment, babies were placed on their mother's lap between two speakers that would play the piece from before, as well as the new one. When looked at by the infant, each speaker would activate its respective piece, causing the child to learn rapidly that it was in control of the stimulus; the speaker it looked at would play music. Lamont found in her experiments that infants tended to look longer at the speaker that would play the piece they had heard in the womb, as opposed to the new unfamiliar piece. A control group of one-year-old infants was also used to test whether the

particular pieces used had some form of desirability beyond prenatal exposure, but it was found that no preference was affirmed by this group.¹⁶

The results of the above study force us to break with preconceptions of childhood amnesia and begin to suggest something very interesting. If we follow the logical assumption that the affinity towards a particularly familiar piece of music is a product of it being encoded into memory, then we can also move into the realm of cognizant, prenatal acoustic perception; awareness. The purpose of following this line of thinking is really to further the argument that our first encounter with the world is also our first formation of a spatial concept via sound. The womb, having the capacity to house a developing human body, also has the capacity to be perceived through the medium of sound. It is this aural/spatial pairing which then allows the social aspect; that of the communicative, which although primarily achieved through receivership, is also actuated into the first form of human socialization. To reiterate: the first space we conceive is wrought through sonic and social characteristics. It all begins with sound, the hermeneutic by which spaces and subsequently human sociability are firstly interpreted. We are left with a tight intertwining of the sonic and spatial, which react within architectural form to contour

the way that human beings relate socially. The breaking of silence at the beginning of human life is perhaps much more profound than we may initially realize.

THE DELICATE ART OF WAKING SOMNAMBULISTS

Do not make any loud noises, somnambulists should not be startled as it may cause distress and disorientation; they should be allowed to awaken on their own accord. This portion of the paper describes a sound installation that was created as part of the design research methodology of this thesis. Being characteristically sonic, there are no images to depict what it was, nor what its results were; only the following description.

The goal of the installation was to break with the usual visual bias of architecture, taking the observer (or listener) out of their comfort zone and forcing a certain kind of attentiveness that is not usually aroused in building users. Rather than crafting an architectural object, the aim was to craft a sonic and social architectural *experience*. As discussed above, it is our ability to hear that locates us socially in the world, even from within our mothers' wombs. As the sounds used for the installation reacted with the form and void of the atrium in which they were played, it was thought that they would begin to shape an

array of spatial characteristics. More simply put: sound would shape the space.

What does this mean? How does sound shape space? For this to make sense, let us delve further into the particular sounds that were used in the installation. They can be classified by Schafer's hi-fi and lo-fi types of sounds. "The hi-fi soundscape is one in which discreet sounds can be heard clearly because of the low ambient noise level."¹⁷ Sounds like a baby giggling and cooing, a karate class shouting, a kitten meowing and a telephone ringing repeatedly were used in this case. They were chosen because they often elicit a direct reaction, and on top of this, being generally foreign to the indoor atrium, would be noticed immediately. Used in short bursts and rather sparingly each sound was then punctuated by ten minutes of silence so that the presence of the installation would be forgotten by the time the next sound played.

The same thing was done with lo-fi sounds. "In a lo-fi soundscape individual acoustic signals are obscured in an overdense population of sounds... [or] broadband noise."¹⁸ The din of a busy city street corner, the pounding of rain on a window, a babbling brook, many voices talking at once, and the thrashing of the ocean were all used for the installation in an attempt to reshape how people using the atrium would (re)act. Again, ten-minute periods of

silence were employed strategically as a means of achieving Schafer's "ear cleaning" technique, so that subsequent sounds would catch building users off-guard and conjure a natural reaction to them. In truth, the installation ended up containing more silence than it did actual sound, but it was found that these periods of calm had a profound impact on the way each sound was then received, whether beginning or ending. Each time the 'somnambulists' were coaxed awake by particular sounds, they were allowed to recede back into their distracted state before being awakened again by a different sound.

Further to this, various anti-ocular measures were employed to ensure that sound sources were obscured from the visual field so that what was being heard could not be easily construed. The sound source was installed overhead and covered in a black sheet as to be invisible to participants. The source was also aimed upward into the void of the atrium to make use of the complexity of its inherent acoustic environment, redirecting the sound and further obfuscating its location. This proved successful, in that people experiencing the exhibit (many of whom were unaware that it was an exhibit) could not find the source of the sounds. In fact, on a number of occasions the sounds caused by the building itself were confused with those of the installation and vice versa,

such as the sound of running water through exposed plumbing pipes.

Sounds carry deep meaning, and for this reason there were also ethical ramifications to the use of certain ones in such a public installation. For example, alarms, sirens, crying, weaponry, crashes and sounds of a sexual nature were all deemed unethical to be produced in this particular setting. Due to the way sound is processed in the brain, having the ability to cause emotional or adrenal reactions that cannot be controlled consciously, and especially since many users were unaware of the presence of an installation, these types of sounds were excluded.

Nonetheless the effect was unexpectedly powerful. When the giggling and cooing of a baby was heard, a kind of happy and jovial space was collectively conceived and shared by many people present. Others did not share this reaction, however, becoming rather confused as to why a baby might be present in such a place and where it actually was; almost a sense of worry. When the telephone sound was played, a general sense of unnerve was shared. That is to say that the space of the atrium became one of slight discomfort to reside in. Conversely, when the sound of the ringing telephone was deemed to have finally stopped, a shared sense of relief was felt. In another case, the surge of the ocean

was played at some length. The effect was a general sense of calm, but more interesting was the reaction when the sound ceased. Other constant lo-fi sounds, like the busy city and the babbling brook had similar effects, that when finally ceased, users became hyper aware of the sounds inherent in the building itself; they began to explore the atrium with their ears. Part of this process was an awareness of the sounds given off by their own voices, which became distinctly quieter as the lo-fi noise was cut off.

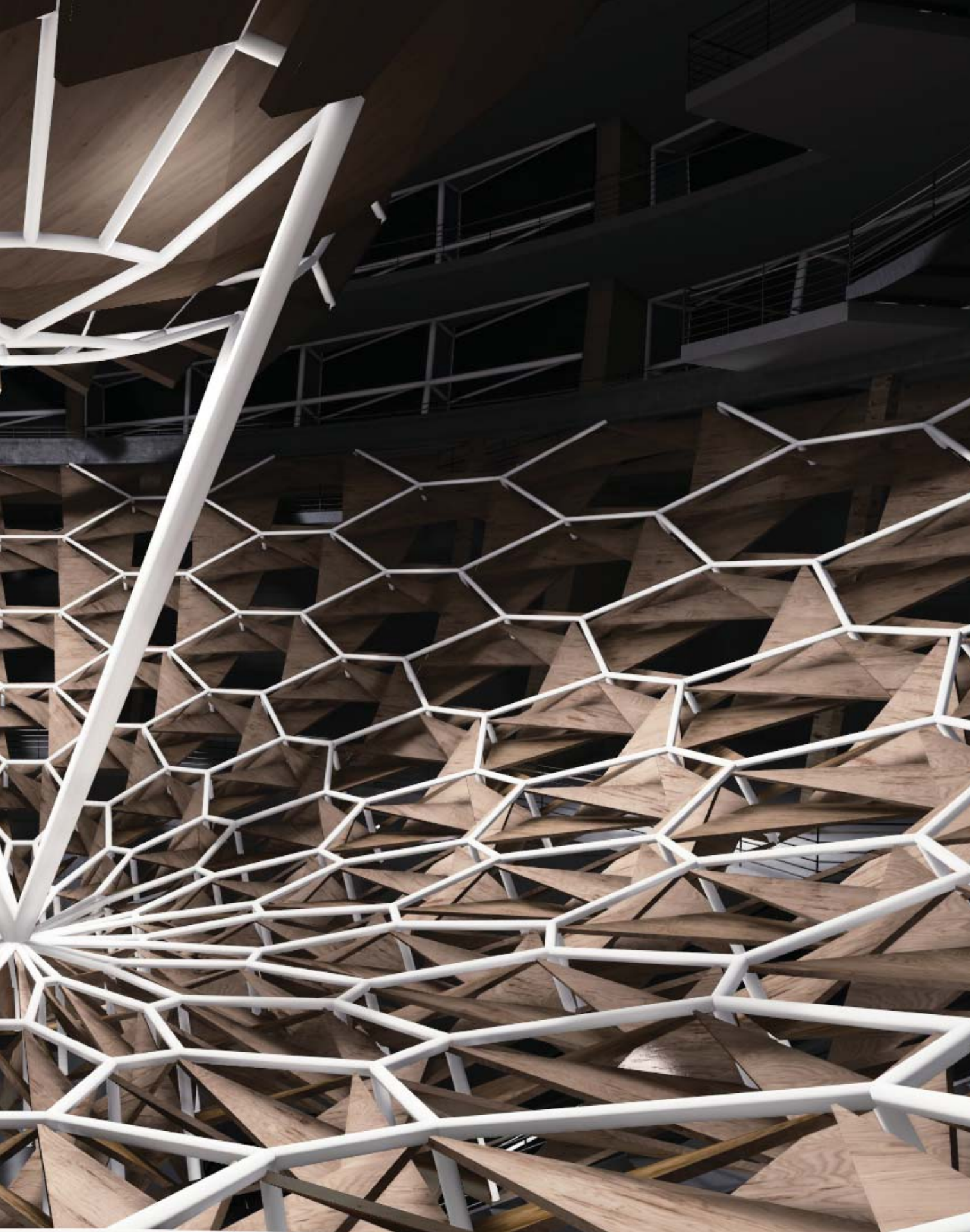
The reason these reactions are being described is that they began to convey something crucial that was hypothesized prior to the installation. When particular sounds were generated that then propagated into and reacted with the scale and tectonics of the atrium, they had markedly different outcomes in terms of the way people within the atrium felt and subsequently acted, both at the individual and social levels. It lent some proof to the assumption that sound could be utilized to forge varying ontological spaces. Again, this is not to refer to space in a physical or tectonic sense as a kind of container, but in a metaphysical sense. Effectively, what the installation demonstrated was that when sound and form collided, a particular notion, or notions, of space could result. The response was subjective, differing among occupants, yet grouped into a

limited number of categories that could be shared intersubjectively. For example, some had positive reactions to the babbling brook, whereas others found it bothersome, while others still were completely indifferent. The possible spaces that were conceived by users was also dependent on the type of sound that was used, whether hi-fi, lo-fi, loud, minute, pregnant with cultural meaning or just general background noise. To illustrate, the loud roar of city traffic that was played severely impeded the facility of communication among occupants, meaning that they could not coordinate work or hold simple conversations without some duress.

The main takeaways from this aural installation were the potential states of awake-ness that the unwitting somnambulist test subjects could experience through the deployment of various types of sounds. That is to say, at the risk of repeating, that sound (as it reacted with form) could shape (or cause) an intersubjective assortment of spaces to be conceived by the building users. These resulting spaces, which are themselves being argued in this paper as *ontological*, or having to do with *being*, subsequently informed the building occupants as to how they might utilize the very building itself. Sound, plus form, equals space, which then equals what humans within it might do, and how they might do it. Here, we are essentially setting up a framework

for architectural programmatic use, albeit one that is much more contingent on sonic input as it is fed into architectonic form. This means that space, in architecture, is really an emergent reading of the possibilities of programmatic use, with sound as the catalytic variable. The equation is particularly nuanced though, because when sound and form are considered together we can see that it is unclear which is the initial input or output of their interaction. At the very least, what this reciprocal relationship entails is that both elements are equally as important as their counterpart. A large edifice may have different acoustic properties than a small one; more: there are material differences to consider. On the other hand, sound types and decibel levels that interact with each of these forms may change their spatial readings entirely; that is, change what is deemed appropriate programmatic use. The dance between form and space is tangled and intimate. This conflation of space and emergent program will be explicated further in a later chapter, but up to this point perhaps we are beginning to see that it is us, the architects, who have been walking asleep when it comes to space as a design outcome.





SHAPE

Humans are beings that participate in spaces unknown to physics:...

- Peter Sloterdijk, "Bubbles"

GRAVITY, PARALLAX AND THE ILLUSION OF SPACE

Since its inception in ancient Greece, the notion of Euclidean space has contoured the very way that we think and live in our world. It has informed physics, mathematics and even language in such a way that to even conceive of 'space' in any other terms seems almost impossible, even heretical. How would we understand void and emptiness; the immaterial or the absence of object? It is time that our long-held preconceptions of space were challenged. In this chapter it will be shown that what we typically conceive of as physical 'space' is subtly, yet clearly, misguided.

While grounded on our planet we see and move with a particularly 'human' reference point to everything that surrounds us. There are arrangements of matter that reflect and refract a portion of the light spectrum in such a way that we call them

'visible', and more still that inhibit our paths and alter our movements on the planet's surface. Things. It is from this common surface that we have built an illusory concept which is collectively and readily understood by virtue of the relationship of physical matter to other physical matter: the concept of physical space. Whether it is your place of seating at the dining table, the experience of walking through the arcades of Greece, or the observation of the relationship of the earth to other celestial bodies, the idea of physical space is always borne out of the same reference point: the relationship of formal matter to the like. Physical space is the concept most useful for understanding this relationship, however the widespread usage of this concept has caused it to become confused as something actual, whereby physical space becomes a thing

to be beheld. Ironically though, by being conceptualized the idea of physical space begins to shed its very physicality, instead urging itself to return to the analogical. This hearkens Kant's understanding of physical space as a means of decoding the sensed external world in his *Inaugural Dissertation of 1770* in which he stated:

Space is not something objective and real, neither substance, nor accident, nor relation: but subjective and ideal, arising by fixed law from the nature of the mind like an outline for the mutual co-ordination of all external sensations whatsoever.¹

Although very interesting, we find him stating two inherently opposed ideas concerning space. Although the idealism described in Kant's expression of space could be said to manifest itself in a type of mental space, there is a problem with the 'subjective and ideal' relationship that he sets up. This conflation of space as subjective *and* ideal stirs up a dichotomy that renders any possibility for the ideal to be muted. Through the lack of preconditions met in order to achieve a *singular consensus of subjectivities*, another way of saying *objectivity* or the ideal, we can say that the ideal is impossible in this scenario. It is true that the conception of space is always the result of subjective

response, as Kant does state, but it is non-sequitur that the 'ideal' exists therein. Perhaps there are points of commonality, but the social milieu of human existences defies any consensus, to which even the gamut of religious and political beliefs provide easy allusion.

In the case of physical space, it can be said that the 'fixed law', to which Kant refers, itself an objective entity, is that which binds all of humanity to its common surface-form: the experience and perception of gravity. From the vantage of being continually glued to the Earth, which itself becomes a form of background white-noise, mostly unheard and unperceived, we gain the basis for a common ground from which we approach the conception of physical space. The problem with the formation of this concept is that it is not conscious of the substrate upon which it is built, becoming the misguided attempt to idealize, or objectify, the subjective. This is evinced in the very phrase 'physical space', effectively another way of saying 'objective subjectivity' — a type of oxymoron.

If we posit that the law of gravity, fully understood or not, is representative of Kant's 'fixed law' by which originates the mind's conception of a physical space, how then does it translate into this idealization of space as described by the likes of Euclid and Descartes? It is because the law of

gravity sets up conditions and arrangements of matter (objects), both cosmological and terrestrial to which another misconception has been applied as to their apparent relationship. The closest link to gravity, and that of the largest scale, is the cosmological interpretation of the movement of celestial bodies in relationship to one another. By observing the movement and locations of stars and planets, physicists and philosophers alike have attributed these bodies to lie within some abstract medium or 'non-medium' within which they move; that of 'space' in the astronomical sense. It is an interpretation which has had pervasive social effects as to the way we think about space everywhere else; as a medium simultaneously characterized by the properties of a non-medium. This presupposition of the non-medium of cosmological space has created an easy transition to that of the human body and its movements in relation to other bodies on the Earth's surface.

As articulated by David Morris in *The Perception of Space*, following the footsteps of Maurice Merleau-Ponty and Edward Casey, respectively, there arises the problem of *depth*.

Depth is what gives bodies volume in the first place, it is what makes situations possible...depth should

really be called the "first dimension" rather than the "third": that is, depth is the most primordial dimension, not a 'bonus' dimension added to the other two.²

For this problem to be surmounted, Morris surmises that an understanding of depth, via movement, is necessary in order to perceive space. (As has already been mentioned, there is a problem with this scenario in that space is not something perceivable but rather something to be *conceived*.) Further to this is still the problem of tautology though: By understanding depth, the first dimension of space, we then understand the fullness of space? This argument cannot stand, representing a symptomatic response to the presupposition of Euclidean and Cartesian space as the operative framework, which this paper seeks to debunk. How can we describe space with space? All that Morris does is give one arbitrary Cartesian spatial dimension more prominence than the others. What he perhaps more rightly describes by appealing to movement as the articulator of depth is a phenomenon derived from astronomy and the viewing of celestial bodies great distances away known as *parallax*.

For those unfamiliar with this phenomenon, it can be illustrated quite simply. Imagine walking on a path through a

forest in which your field of vision comprises mostly tree trunks. As you move down this path, those trees which are closest to you will appear to move by faster than those more distant. The effect is a layering of objects whose visual relationship changes based on the movement through and beside them. Parallax is also a common effect caused by the difference between a camera's view finder and that which the aperture captures. Even more simply, it can be experienced by viewing an object while closing one eye and alternating to the other back and forth; the object's placement will appear to move.

The effect of parallax is caused by depth in relation to different points of view. A moving body, whether human or celestial has a point of view that is constantly in flux in relation to other bodies, which causes the relative position of each body to physically, hence visually, change. Back in the forest, do we perceive physical space based on the change in relative position of each tree to our own point of view; by experiencing movement and depth? Counter-intuitively, we actually do not. Space is not perceived in this scenario, but rather simply relative distance and position, or even a sense of depth (as aggregate distances of objects), but not space. Remember, we cannot use depth to understand space because of the cyclic logic employed, which would find us returning again to a sense of depth

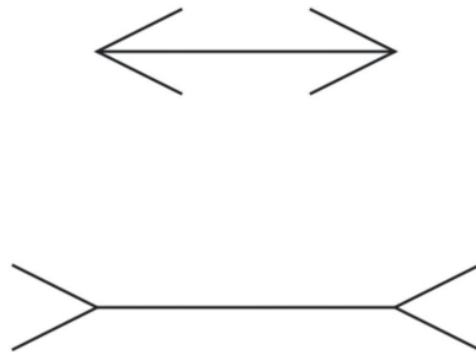


Figure 2. The Müller-Lyer illusion, depicting lines that appear to be different lengths although they are the same.

once having sensed space. It is an endless loop. Our relative reference point to other bodies implicates itself by association of a previously shared relationship. To call this an understanding of space does not satisfy an escape from a simple, yet effective, illusion.

Contrary to Morris (and Merleau-Ponty), it is not the movement of a body along some depth vector that articulates space, but is instead a positional relationship of bodies to other bodies, which creates the *illusion* of space. Here, we fall back on the description of material form, and not space. The phenomenon of parallax causes the illusion of space based on the perception of an object's relative position to other objects. This phenomenon is sequitur to normative ways of thinking about space, especially those of the Euclidean and Cartesian orders,

and if left as is can remain sequitur in their closed system. But these notions of space are being challenged here; they are the results of an illusion.

Does the perception of an illusion render the thing being perceived somehow incorrect? Can perception be wrong? The idea of physical space being an illusion would undoubtedly be a point of contention for both Morris and Merleau-Ponty, considering their writings both convey a subscription to the truthfulness of perception *even as it applies to illusions*. They argue that perceiving an illusion has an inherent lability toward a ‘truthful’ outcome of sorts. What this means is that although illusive in terms of a definitive conclusion, an illusion still represents an inherent truth. The Müller-Lyer’s optical illusion provides a good example, which Merleau-Ponty himself refers to: It consists of two line segments of equal length whose ends are each terminated with inward-facing and outward-facing arrows. The illusion is created by a warping of the original equal length of the segments, being perceived shorter and longer, respectively. The argument that Morris attempts to make is that there is no objective basis with which to compare the line segments, and therefore, being in a closed system of comparison, there is no basis by which to judge the illusory perception as being untrue. According to Morris, this means

that the perception of an illusion can never be untrue; that the illusion *is the thing to be perceived*. When his reasoning is applied to the illusion of physical space however, this argument begins to break down.

Brought alongside the Kantian understanding of space as a subjective non-entity, the objective basis for understanding space encounters familiar problems of idealism. Firstly, if one considers themselves again as the subject walking through the forest, the sole point of view, what happens if other subjects are introduced onto the path; other points of view? Can we apply

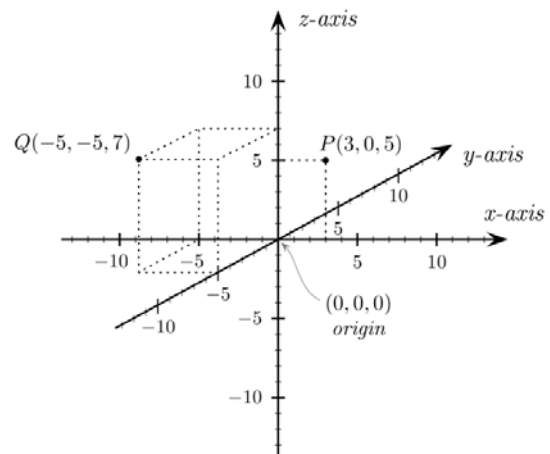


Figure 3. A typical (mis)representation of space in the Cartesian sense. The way we perceive objects as containing a void, like the dashed rectangle here, causes us to spatialize what are strictly physical and formal relationships. Point Q has a physical/formal relationship to the origin, not a spatial one. Is this image perhaps an optical illusion as well?

Morris's illusion argument and say that there is no objective basis by which to compare the forest to some other reality? This would mean that no matter who perceives the 'space' of the forest, each perception would satisfy the reality of the forest, being inherently true or 'objective'. Another way of framing this is that because we cannot leave the 'space' of the forest, we have no way of judging the truth or untruth of our situation from outside, therefore each individual perception of the forest remains true. There is no other option; we are locked in the illusion. This is itself a bit of a magic trick though. Sleight of hand on Morris's part has allowed us to unwittingly conflate objectivity and subjectivity as one entity; he has rendered subjective spatial experience invalid by deeming all interpretations valid. However, this flies in the face of space being entirely a subjective conception. If physical space is an illusion, then Morris's argument is satisfied, being in a closed system of perception. But what we have discussed is that this reasoning is cyclic, a proper understanding must come from outside the thing itself. It is for this reason that gravity and then parallax have been introduced, as a means of untangling the closed loop of the understanding of physical space. What has happened is that gravity and parallax together, the 'fixed law' and its phenomenon through movement, which themselves have

bearings on form (not space), have been misconstrued and subsequently generated the illusion of physical space. These two entities are, at the least, a start for the objective bases that are required for Morris to break free of tautology.

If we carry the methodology of the illusion further, we find that the inherent truthfulness of perception is present in the objective physical phenomena (gravity and parallax) that contribute to the misconception of space being physical. This does not necessarily mean that they give rise to subsequent objective understandings, but instead open up possibilities of interpretation.

To illustrate his point of a dynamic and changing, yet always truthful, perceptual reading of an illusion, Morris makes reference to the Nekker cube. It is a very simple optical illusion depicting the frame of a cube that seems to recede into the page or jump out from it depending on how it is perceived by the viewer. His analogy begins to reverse its reasoning at this very point though, rather than containing a dynamic idealism, or objectivism(s), the illusion actually elicits multiple subjective readings: recession, jump, or no effect. This is where Morris has blurred or idealized subjective responses into a singular objective whole perhaps through sleight of hand. He has carried out the Pledge and the Turn of his trick, but failed to deliver the Prestige. In the same way that

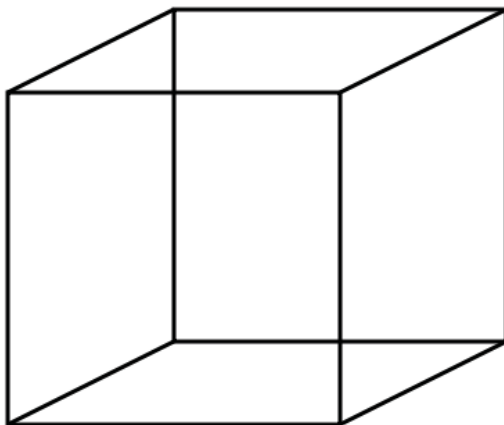
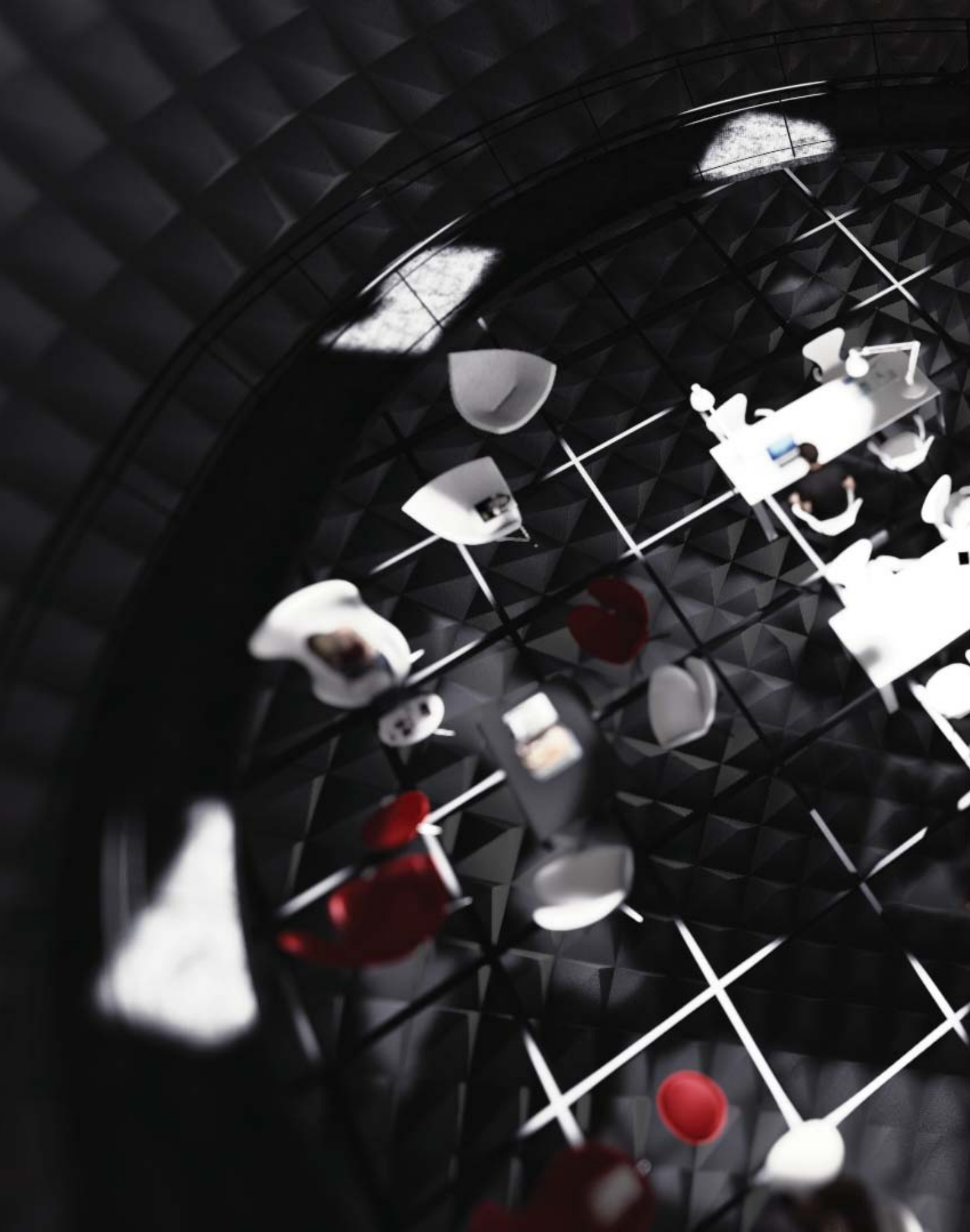


Figure 4. The Necker Cube illusion, which tends to jump out, recede or look flat, used here to illustrate that one thing can be interpreted intersubjectively.

one can change one's opinion on a matter, the illusion conjures differing subjective responses to itself. The effect is multiplied further as more people view the illusion and add their experience of perception to the mix. The social experience of the illusion generates a complex mixture of possible combinations of perceptions, and although there may be many in common, the result is a dynamic *intersubjectivity*.

This plurally subjective reading of optical illusions can be appropriated back to the illusion of physical space postulated earlier, which supports the shedding of the idealized notions of Euclidean and Cartesian space. Although they are extremely useful means for understanding our world, they actually fall short of describing space itself.

Instead, defaulting to the description of form and matter — like the relationships of objects as described by the law of gravity and the phenomenon of parallax — the idea of physical space presents itself as a residual illusion of these formal/physical effects. It has been shown above that these notions actually describe something that is also predicated and developed on tautological reasoning; the reliance on a preconceived 'spatial' vector (depth) to attempt an understanding of space itself. Again, it must be stressed that space is not physical, so any attempt to transpose it as such by other physical means does not make sense. It must also be emphasized again that space cannot be an idealized or objective 'thing' because this constitutes an ability to be perceived outright. This ability acts reflexively, circling back, requiring that the thing being perceived is objective or ideal or 'true' in the empiric sense, so that what it is can actually be determined. However, this does not characterize space, which is both ontologically and subjectively determined, not as some physical allusion, but as another mental concept entirely. Once we begin to understand that all of our idealized and objective delineations of physical space are generated as illusions by the perception of formal and visual phenomena, we can then begin to refashion a different way of thinking about space.





SPACE

Unfortunately, any definition of architecture itself requires a prior analysis and exposition of the concept of space.

– Henri Lefebvre, “The Production of Space”

THE ONTOLOGY OF SPACE

For centuries, if not millennia, questions concerning space have haunted and entertained philosophers. There has been much thought put forth throughout history concerning ‘space’ and its many manifestations and social effects. For the scope of this work, it is perhaps an insurmountable (and unnecessary) task to fully encapsulate all ideologies and theories and digest them into an easily conceivable holism, except perhaps by saying that space is complicated. However, this does not need to be the case, and in fact it will be argued that many of the stray tangents of spatial theory can be consolidated into a relatively concise, yet different, understanding wrought through the perception of sound. As the title of this work suggests, ‘sound shapes space’. It could perhaps not be framed any more simply — nor more vaguely. But before this

axiom begins to snap into focus, we must continue to dismantle our preconceptions and normative ways of thinking about space.

In the last section it was shown that form has been confused with space, and an attempt was made to distinguish them so that the illusory nature of physical space could be highlighted. This section will continue the illusory demarcation of physical space, but will move into the realm of mental space, continuing into social space. Much reference will be made to the work of Henri Lefebvre and Peter Sloterdijk, both recent and seminal spatial philosophers, with the goals of both critiquing and steering their ideas to reconstruct a case for a spatial ontology in architecture predicated on the perception of sound. This radical reconception of space will then be utilized in the next section to inform an application to

architectural design that re-establishes the forgotten, insoluble partnership between form and space.

Let us return again to metaphor. George Lakoff and Mark Johnson, linguist and philosopher, respectively, write: "The essence of metaphor is understanding and experiencing one kind of thing in terms of another."¹ As was discussed earlier in the prologue, 'space' has become a widely used, yet seldom recognized metaphor that we live by; a form of non-listened white-noise that affects our entire human context. In a dizzying sweep of instances, from physical space, political space, religious space, geographic space, cyber space, virtual space, mathematical space, outer space, inner space, open space, tight space, public space, intimate space, shared space, personal space, head-space, exterior space, interior space, big space, small space,...*ad nauseum*, 'space' itself becomes one of the ways by which we understand the world. This is not something akin to space alone; the use of metaphor to comprehend and express ideas can be seen in myriad other areas, to the point where we must concede that one of the primary ways we communicate, understand and reciprocate is through metaphor. One such example discussed by Lakoff and Johnson is the prolific operative metaphor 'Argument is War', which not only manifests itself in the way we talk, but also

in the very way we conceive argument to begin with. If our fundamental conception were to be something else like 'Argument is a Dance', it would have drastic effects on the way arguments even occur. The interesting thing is how these established metaphors (conceptual systems) then begin to reshape the very way that we perceive things, slanting our subjective responses to other concepts. Lakoff and Johnson posit:

Our concepts structure what we perceive, how we get around in the world, and how we relate to other people. Our conceptual system thus plays a central role in defining our everyday realities. If we are right in suggesting that our conceptual system is largely metaphorical, then the way we think, what we experience, and what we do every day is very much a matter of metaphor.²

This begins to foreshadow why it is important for architects to reconsider the conceptual system by which they think about 'space'. If we do not consider it, then we run the immediate risk of operating with disregard to that which "defines our everyday realities," as Lakoff and Johnson suggest above. Arguably, this lapse in reality has already occurred in architecture as the

result of a disproportionate weight placed on the importance of form, at the cost of space. It should be reasserted that this work seeks to rebalance the scales of form and space, via sound. They are inextricably linked in the following way: sound reacts with form to then inform conceptions of space. These spatial conceptions then directly inform the way we relate to ourselves and to others within architecture; or how we exist and what we do. Space, interpreted via sound as it reacts with form, has a profound effect on our state of being, and it is for this reason that the idea of the ‘ontology of space’ is being urged. Space affects how we exist! This is why it is important to understand it as architects. However, the prolific metaphorical usages of ‘space’ that were listed above have caused its meaning, on the whole, to become diffuse and inarticulate; unreservedly useless to architectural design. Rather than tackling this deluge of metaphorical misuses, though, it would perhaps be more prudent to examine some form of organizational structure that groups common ideas of ‘space’ into principally shared meanings, instead of itemizations. For this we can turn to Henri Lefebvre and his seminal work *The Production of Space*.

Early on in his work, Lefebvre — being the proper Marxist that he was — distilled three key ways of characterizing space very much related to codified social modes of

production: ‘*spatial practice, representations of space, and representational spaces*.’³ The first, ‘*spatial practice*’ refers to our unconscious social milieu, in what Lefebvre confusingly and almost immediately transposes as being ‘social practice’.⁴ This is perhaps one example of many more that characterizes a frustratingly prolific diffusion of ‘space’ as a concept; being stamped onto everything. In an act of convenience, Lefebvre seems to transmute the word ‘spatial’ for ‘social’ so that he can capture more in his net. It is this very act of misuse of the metaphor of ‘Space as a Container’, which sends us downhill, further and further away from dialectical clarity. Nonetheless, what he means by ‘*spatial practice*’ is the collection of social, political, geographic and economic forces, that is, those that embrace production and reproduction, that comprise the background conditions of daily life. “Like all social practice, spatial practice is lived directly before it is conceptualized; but the speculative primacy of the conceived over the lived causes practice to disappear along with life...”⁵ Hence, *spatial practice* fades from cognizance, becoming the base condition, or daily and urban realities, from which his next two key ideas, ‘*representations of space*’ and ‘*representational spaces*’ are generated. The best way to categorize ‘*spatial practice*’ is as ‘physical’ space; a kind of social scaffold.

'Representations of space' constitute those things "...which are tied to the relations of production and to the 'order' which those relations impose, and hence to knowledge, to signs, to codes, and to 'frontal' relations."⁶ What Lefebvre refers to here is the domain of "scientists, planners, urbanists, technocratic subdividers and social engineers, as of a certain type of artist with a scientific bent."⁷ These types are those that identify what is perceived with what is conceived; an idea which is the subject of critique for this paper, as discussed in part two. The most readily attainable examples being those of Euclidean and Cartesian space, which are a direct transposition of what is perceived into what is conceived. Think of the three-dimensional vectors of the room you are in, now mentally translate them into mathematical language or the digital space of a computer; consider which one informs the other. They have become linked in such a way that the perception of one contours the way we conceive of the other, and vice versa. Further to this, consider how the very idea of Cartesian space has extended to affect systems of verbal communication (metaphors) and the landscape of intellectual signs. The simplest way to categorize Lefebvre's *'representations of space'*, in his view the most dominant in society, would be to call them 'mental' space.

Lefebvre's third idea, *'spatial*

representations', speaks of 'inhabitants' and 'users' as they live directly through a society's symbols and signs. Simply put, it could be called 'social' space; that of art or non-verbal symbolism. He posits this type of space as one that is passively experienced and overlaid onto the 'physical' space of society. This is really a brilliant move on Lefebvre's part because it forms a looped connection from spaces of the physical, to the mental, to the social, then back to the physical, creating a coherent whole. He must be lauded for magnetizing many of the stray particles of spatial concepts into a concise trinity, but he has really not given us any idea of how space *proper* is to be understood from here. Lefebvre does not elucidate space, but uses it to elucidate everything else. This reflects back on the point made earlier regarding the prolific and ubiquitous usage of space as a metaphorical concept.

Upon delving into *The Production of Space* we come through with no clearer understanding of what 'space' even is, but instead a very disorienting sandstorm of types of 'spaces' strewn about his framework. Although the spatial triad that Lefebvre leaves us with: physical, mental and social, does prove to be very useful for explicating the complex realities of socio-political production, it does not help us understand space as a clear, yet subjective, ontological concept.

We must dwell a bit further on this physical, mental, social triad. When it comes to driving toward a clearer understanding of the ontology of space, that is, how it relates to *being*, as opposed to *productions of being*, we must attempt to precipitate the three ingredients into something more solid. It should come as no surprise by now that sound will be used as the catalyst to refine these elements; but first some further critique.

We must be reminded of the position of this thesis; that there is no such thing as physical space. There is form and matter, and their interrelations with one another, which at the very least conjures an illusion of space, but not space itself. To illustrate this again, we can come from the angle of metaphor once more, and how our visual field manifests its perceptions of objects and forms:

We conceptualize our visual field as a container and conceptualize what we see as being inside it... The metaphor is a natural one that emerges from the fact that, when you look at some territory (land, floor space, etc.), your field of vision defines a boundary of the territory, namely the part that you can see.⁸

Here, Lakoff and Johnson remind

us of our propensity to ‘spatialize’ visually perceived physical objects as they relate to others, such as chairs in a room. The ‘Space as Container’ metaphor that they describe becomes one of the ways we cull visual information and make sense of it. However, it is still not determinate as to how this constitutes a physicality of space *per sé*. It clearly does not — and this may prove to be a difficult preconception to get over, or thought to be an act of splitting hairs — but the fact remains that a space cannot be proven physical, only conceptualized, and must therefore remain metaphysical. It should be noted that what Lefebvre classifies as physical space connotes political, economic and societal notions, whereas his framing of them defies even physicality itself, relying on mental projections to codify physical objects. For example, a physically abstracted ‘political’ reading of space as applied to the built manifestations of a political system’s power (architectural edifice), means that we must already rely on preconceived ‘spatio-political’ notions to then lend built edifices their political signification. Lefebvre seems to presume a physical space existing in and of itself, which is then identified as such by other representational (mental) signs that spawn from it, such as political power. In this case ‘physical space’ cannot exist in its own right, because the physical/spatial conflation actually constitutes the projection

of a preconceived spatially contained idea onto material forms; a kind of medium in which they reside. Lefebvre is using a spatial metaphor to describe something physical, while recursively allowing the physical thing to dictate its own conceptual 'spaceness'. This represents a paradox that cannot lend support to either side of the equation. Physical objects/forms *do* exist in this case, but physical 'space' here does not exist, and can therefore be subsumed into that of the next strata: metal space.

If this is true, that space is metaphysical, we can move on to Lefebvre's next 'mental' classification of space, which brings us somewhat closer to Kant's reading of it. Here we have some dangerous overlap though, which perhaps merits a return to the illusionary. Lefebvre posits that this mental space, which he calls '*representations of space*', is the identification of what is perceived with that which is conceived. This idea actually makes sense and will be utilized to suggest this very thing as the perception of sound feeds potential conceptions of ontological space (space that affects being). However, there is a distinction that must be made: in Lefebvre's case objective *perceptions* seem to construct objective *conceptions*. This has the propensity to generate idealized preconceptions of space, for example, Euclidean space. It is also another cyclic understanding of

space via itself, through the spatialized misinterpretation of our visual field and over-amplification of socio-culturally ingrained spatial metaphors. As was argued in "Gravity, Parallax and the Illusion of Space" above, this does not follow a logical pattern. In Euclid's case, enveloped in the context of the ancient Greek city, his observations of this physical reality (perception) fashioned his way of thinking about some kind of physical representation of space (conception). The trouble with this formulation is that it does not leave room for subjectivity in terms of what is conceived.

When we are speaking of space, the perception of an *objective* physicality cannot translate into an *objective* conception of it, but instead the conceiving must be open to an array of interpretations. This is the nature of concepts: that they remain subjectively derived through the community of human interpretation. Concepts *must* be able to change and be reinterpreted because when they fall into idealism they achieve an 'objective' status that no longer renders them pliable *qua* subjective. The very etymology of the word 'objective' contains its root 'object', which refers to a "tangible thing, something perceived or presented to the senses."⁹ Oxford English Dictionary characterizes 'object' from the medieval Latin *objectum* which means a "thing presented to the mind."¹⁰ (Italics mine) The danger is when a

concept becomes idealized it then takes on the characteristics of an 'object', rendering it then perceived or presented to the senses as objective reality. Mental concepts of space that have become ideal notions, like those purported by Lefebvre and Euclid, lose their conceptual, subjective, status and become solidified objective realities. This circumvents their very 'conceptuality', becoming new objects for us to perceive alongside Real physical matter. But, space is only ever metaphysical, only ever conceptualized, and must remain as such for it to matter ontologically. Lefebvre has come quite close here though, and this paper intends to invoke his very idea that percepts *inform* concepts. The difference herein is that the perception of sound (objective) informs conceptions of space (subjective). This is contrary to what seems to happen when the visual perception of objective reality translates into subsequent ideal or objective realities of space that defy conceptuality and hence subjectivity — *i.e.* Euclidean space. This idea will be expounded in the next section, but first we must tackle Lefebvre's final classification, social space.

For Lefebvre, social space is what he refers to as '*representational space*'; an extension of mental space that is unconsciously, or passively, experienced. He states that "[i]t overlays physical space, making symbolic use of its objects."¹¹ This

social space is like a cultural blanket that is draped onto physical reality, and is the collection of images, symbols, and signs through which we directly live. It is this social space which Lefebvre loops back onto his idea of physical space (e.g. the built world) as we seek to change, appropriate and utilize our system of non-verbal symbols and signs to construct it. If applied to architecture, we could say that the social space (culture, values), as fed through the mental space (physics, science), then generates physical space (edifice, political landscape), and finally comes full circle to re-inform the social space again via the cultural meaning of these productions. However, as we explore the looped nature of this triad, its circle begins to grow tighter and tighter until we are left with something that may in fact be one, indistinguishable, singular idea.

Let us remind ourselves that Lefebvre is using the word 'space' like a sieve; a sifting metaphor. This means that when he refers to physical, mental or social 'spaces', he is trying to catch certain socio-political, socio-economic and socio-cultural sediments and sift them into an organizational stratification that is more easily grasped. Although this is useful for understanding the complexities of our world, it breaks down when he tries to redeploy it as something containing the ingredients to produce space. He means this in the strictly Marxist sensibility, as a





breakdown of a society's productive and consumptive forces; an analysis of what they are and how they can be *reproduced*. If all of these spaces (physical, mental, social) can be '(re)produced', Lefebvre's argument follows that we have the capacity to engage in the production of space. This idea is intriguing in its own right, but perhaps more so when applied to architecture in principle. This is not to say that architecture should be used for the perpetuation or production of political or economic ideologies — this arguably already happens as a residual effect of social practice — but it can be used to suggest an avenue for the design of space, in the ontological sense, as applied to form and architecture. This is where the thesis of this paper begins to merge carefully with Lefebvre's ideas concerning space as a metaphor/concept; we are both attempting to speak of humanity in ontological terms (how we exist) and are attempting to suggest that space can be produced or *designed*, even though we define space extremely differently. Perhaps we could also say that Lefebvre is concerned with over-arching socio-political forces in what he would call 'social practice', whereas this paper is concerned with social practice in a more banal, or perhaps focal sense; of humans simply as they exist with other humans and their built edifices, and especially how conceptions of space affect them existentially.

SONO-SOCIAL SPACE

Architecture is the spatial substrate of human social interactions and relationships. Formally, it fundamentally and automatically assumes its role as a background condition that facilitates the interactions of all humankind. This is manifest from the earliest vernacular of human shelter, through to the most colossal of contemporary built works; architecture is for humans *being*. The ocularcentric approach that architects employ to both design and representation is a gross reduction of the potential for architecture to connect with human beings in the full scope of their senses and sensibilities. There are other sensory avenues by which this visual slant in architecture can be rebalanced, like the haptic, but it is only the aural that has the capacity to connect with us at our deepest existential levels. In the same way that the unspoken mother/child communion in the womb begins the formation of the self, or the infinite screaming silence of the cosmos stirs fear in us, sound facilitates a way in which we achieve a kind of dialogue with the architectural creations we inhabit that the merely visual cannot achieve. Finnish architect, Juhani Pallasmaa, writes in *The Eyes of the Skin*:

Sight isolates, whereas *sound incorporates*; vision is directional,

whereas sound is omni-directional. The sense of sight implies exteriority, but sound creates an experience of interiority. I regard an object, but sound approaches me; the eye reaches, but the ear receives. Buildings do not react to our gaze, but they do return our sounds back to our ears.¹² (Italics mine)

The key idea that Pallasmaa has expressed, is that “sound incorporates.” Further to this, he frames sound in such a way that it establishes a relationship between the person and the building; a type of unspoken, yet mutually listened dialogue between humans and architecture akin to our common and originally inhabited prototype: the womb. It is important to make the distinction between the ways that the visual and the aural are perceived; Pallasmaa points out that vision is directional, while sound is omni-directional. In this way, the sense of hearing functions as the means by which we encase and arrange ourselves amidst each other, as if in bubbles that can blend and overlap while remaining distinct entities. More: sound as it reacts with matter determines how we *locate* ourselves within the void of a built form, through the interaction of sound as it reverberates and surrounds us, in a markedly different manner

than static material form might surround us. This sense of location via sound becomes important to the discussion because it does not necessarily refer to a physical type of echolocation that can place us *somewhere*; at least not in the discussion of this thesis. For this we must extend Pallasmaa's physical description of sound as locator into spatially ontological terms. In order for this to make sense we must first also distinguish the ways in which we actually *are* located within buildings, which come as two simple relationships. They are the relationship between humans and buildings, and the relationship between humans and humans *within* buildings. The latter is directly linked to the former, and is borne out of it in a critical way. One could say that the relationship between humans and the architectural edifice within which they locate themselves has a direct correlation to how they also relate to one another outwardly, and to themselves inwardly, that is to say *socially*, on the whole. What we hopefully begin to see is that architecture is not strictly experienced visually or formally, but equally so sonically, socially, and spatially.

The social aspect is almost a given, an umbrella that covers occurrences within both form and space, but the key difference is that the intersubjective ontological spaces that we inhabit within architecture contour the very act of socialization itself.

This idea is more pronounced by space (and sound) than it is by form (and light) because it is much more dynamic and apt to emergence, change and chaos when compared to the static nature of material edifice, whose iconography and original built intent change at a much slower rate. The space collectively conceived is borne out of a sonic reaction with static form, but it is still the thing more attuned to the social dynamism of everyday life than is the rigid building in which the dynamism is able to occur. Within an architectural edifice there exists an intersubjectively conceived space that is generated sonically and socially: a thing that will be described herein as 'sono-social' space.

This presents a problem for 'Architecture' as a discipline and practice that is swept up in the dogmatic visual representation and design techniques of its own craft. We must begin to question the efficacy of a staunchly visual approach to design, especially when the constructed end result of our designs are not strictly experienced by the eyes. Visual representation in architecture will be discussed later in this work, but for now we must develop further the idea of the sono-social space of architecture.

In her piece for the 13th International Architecture Exhibition at the Venice Biennale, Polish pavilion curator and sound

artist, Katarzyna Krakowiak posited that: "...architecture becomes a subtle, invisible way of organizing our social life. Sound-wise, walls, floors, ceilings, heating and air-conditioning systems are all means of connecting and transforming our social relations."¹³ She infers that the simple banality of everyday sounds present in life lived through buildings have the ability to both represent and reshape our social codes; something that Schafer explicates at length in his book *The Soundscape*. The exhibit at the Polish pavilion drew on this idea, utilizing the sounds inherent in the building and amplifying them back into the floors, walls and ceilings. The title of the exhibit "Making the Walls Quake as if they were Dilating with the Secret Knowledge of Great Powers" conveyed exactly what Krakowiak was able to achieve in her work. The noises generated by visitors of the pavilion and the sounds of the building systems were played back to them in such a way that the edifice itself literally 'quaked' and figuratively dilated as the sounds changed dynamically. The effect was a rather strange one, whereby the normative experience of patrons visiting an architectural exhibit was subverted to become one not of the visual consumption of images and models, but instead of a collective aural experience whereby the exhibit consumed *them* instead. The approach, which inspired 'The Delicate

Art of Waking Somnambulists' discussed above, became a commentary on typical architectural exhibits which require visual consumption in order to be experienced. There was no form as such, only an empty room filled with sound emanating from its periphery and users. The effect was that the space usually conceived within an architectural exhibit, and hence the behaviour of its visitors, was transformed; the way in which users might typically act in an exhibition space was changed by the type of sound present in the room.

To put this in specific terms, and perhaps describe the experience, we took very few pictures, we lay against the walls, we sat on the floor, we simply stood and listened. This is a drastically different way to experience an architectural exhibit, but more interestingly is one that is much more akin to the way we might actually experience architecture! Krakowiak was able to exemplify the postulation of this thesis that sound is able to shape space. The only difference being that space herein is closely correlated to social behavior; it is the thing that determines it. On this point Krakowiak and myself agree, and we have both been able to affect normative social behaviour in different settings, but she attributes it in an objectified manner, linearly from sound to social life, whereas this thesis pushes a step further into the realm of the intersubjective.



Figure 5. Inside the Polish pavilion at the 13th Venice Biennale of Architecture experiencing the quaking of the walls and general sonic environment. The full experience is impossible to properly photograph, much like architecture itself.

This means that although sound is in fact the objective physical instigator, or catalyst, the perception of it is still able to be interpreted subjectively. For example, in the case of the Polish pavilion, some visitors found the lack of anything typically found in an architectural exhibit to be strange and boring, subscribing to the subjective opinion that a room filled merely with sound was not their cup of tea,

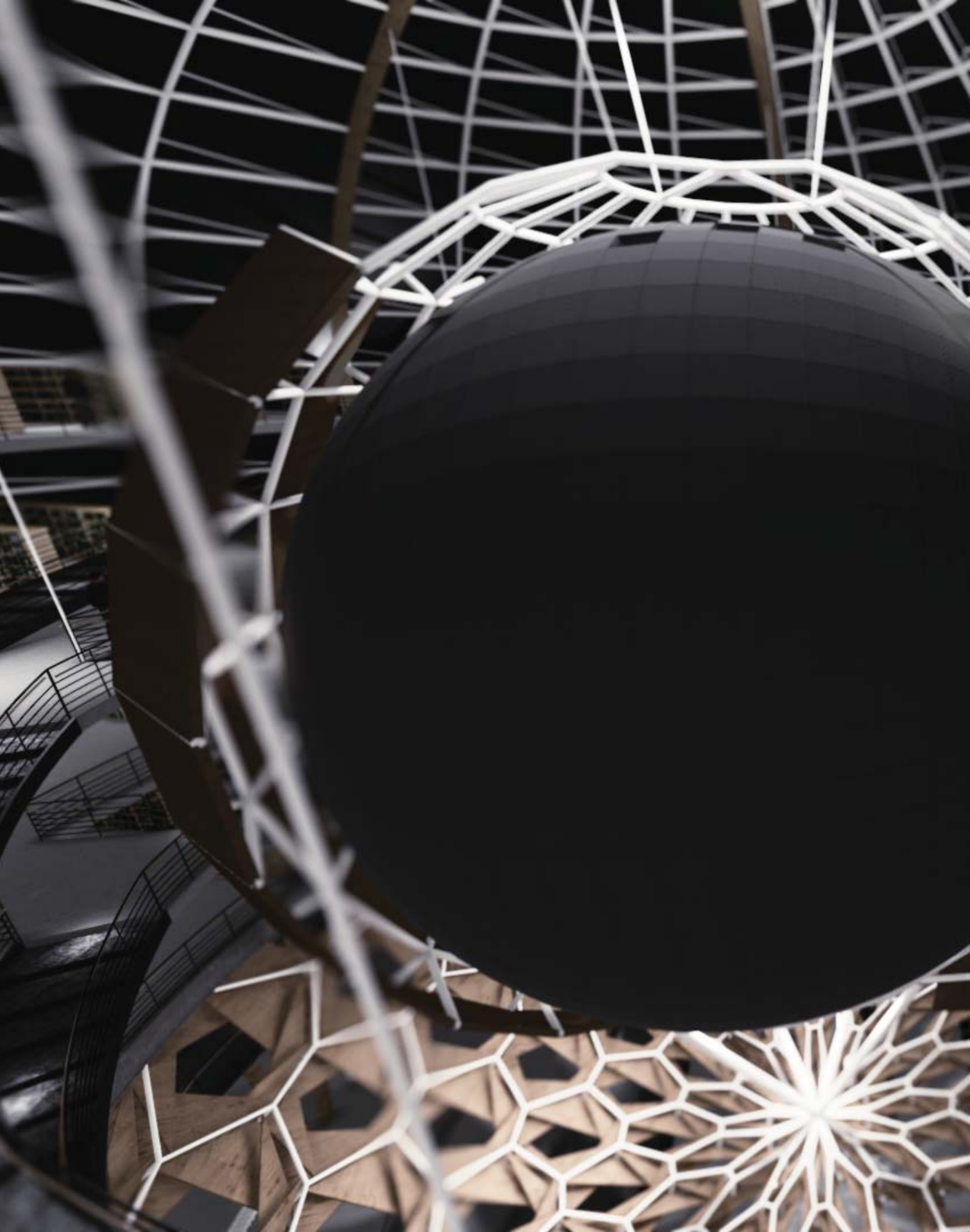
architecturally speaking. Conversely, other visitors found the experience profoundly interesting, remaining in the room and groping the walls to find points of strong amplitude (quaking) and listening to the various sonic effects present. Still others formed no critical opinion at all. This result connects back to earlier discussions of the perception of illusions and their objectiveness being open to intersubjective interpretations. The corollary principle here being that the perception of an objective thing, in this case the sounds of the pavilion and its users, leads those very users to varying subjective conclusions, which we will call *spaces*, and hence leads them to act in various ways as a collective, *qua* social entity, based on the spaces conceived.

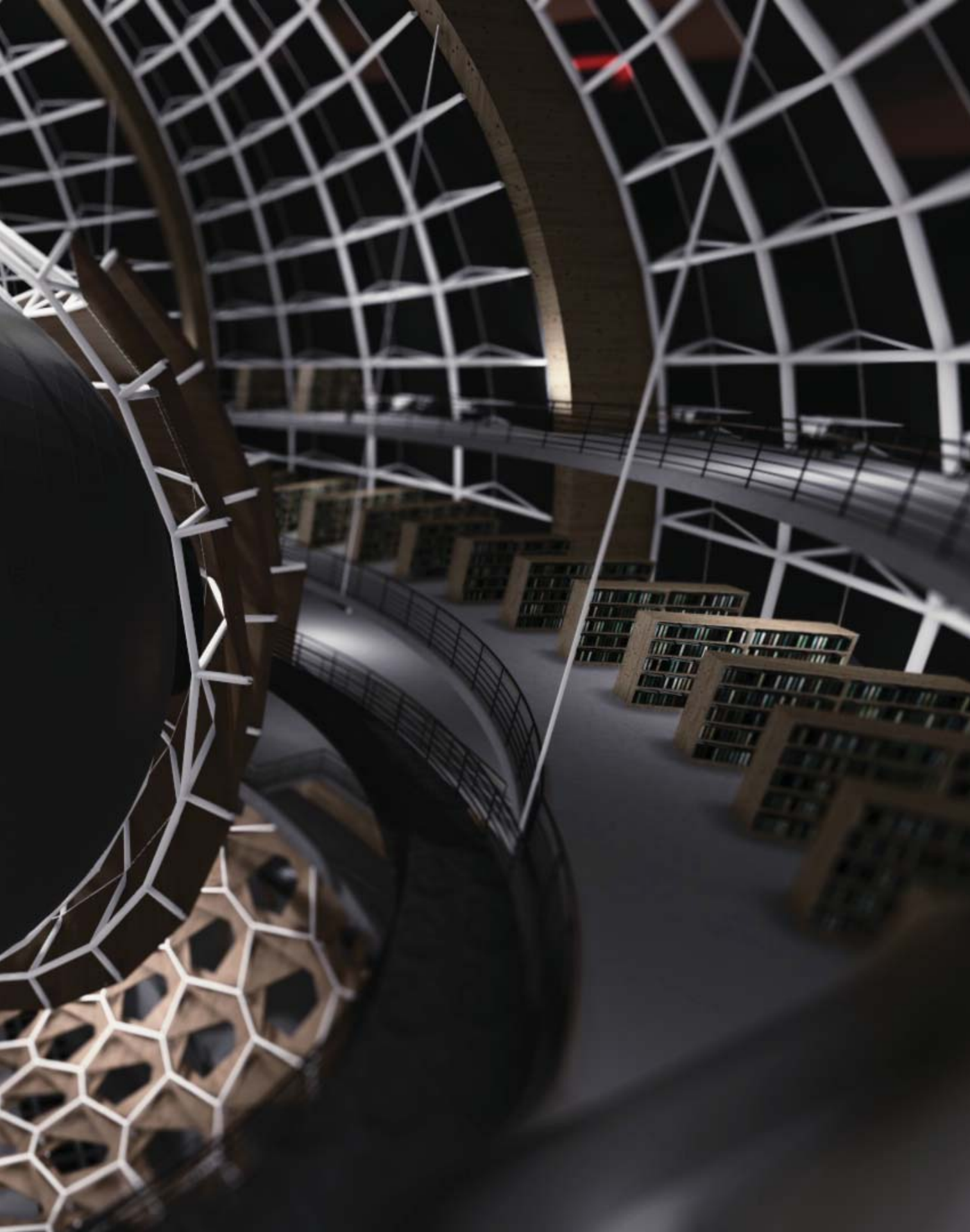
Krakowiak's Polish pavilion is highly pertinent as an example because it amplifies the idea that there is a dialogue between humans and their buildings, which then affects them intrinsically on a social level. This effect is called space; a mentally and yet unconsciously conceived posture that can change social practice. As sound specialist Julian Treasure notes: "Sound affects us physiologically, psychologically, cognitively and behaviorally all the time. The sound around us is affecting us even though we're not conscious of it."¹⁴ Space is then formed intersubjectively as each different person being affected by the

sound interprets it. For various cultures or upbringings, different sounds carry different meaning for people and can therefore be spatialized in different terms. For instance, does the bustle of a city conjure feelings of home and a space of calm, or the opposite: a sense of restlessness and fatigue? Since each interpretation of the sound is different, but there is much room for shared readings, we can say that the formation of sono-social space is indeed intersubjective.

At this point it is worth reiterating that architecture plays a key role in the creation of space because sound can be utilized as an ingredient that reacts with tectonic form, scale, and materiality for the intentional generation of intersubjectively conceived space as a design outcome. If this idea is carried further and aligned with the thesis of this paper it means that architecture can be extended to the emergence of modes of existing (ways of living) whose outcomes are a result of the discretion of architects who think carefully about how sound truly affects humans as they inhabit the built world. It is important also to reiterate that this is not intended to fall at any point into the objective, meaning that a space which has been designed cannot be intended to cause some singularly designed dogma of social praxis. That approach easily falls back into the strict and fallible notions that have plagued modernist thinking in the past.

Rather, architecture postures itself contingently, perhaps even humbly as, yes, an objective, physical thing, but one that opens itself up to intersubjective possibilities via the inherent sono-social dynamism of everyday life reacting with architectural form. Think back to the optical illusion discussed earlier. It is an objective thing that still allows the emergence of various subjective interpretations. Architecture can function in the same way, but unfortunately this seems to have been forgotten or forced upon form and vision by architects. We must reinject sound as a critical ingredient in the design of buildings — as an architectural essential — because it is the very thing responsible for the creation of space.





(MIS)REPRESENTING SPACE

*...a fact that we do not often think about or even realize, is that
architecture is not building.*

– Aaron Betsky, “Out There: Architecture Beyond Building”

SILENT MODEL FOR AN URBAN SPACE

Images are mute. They do not speak of architectural space. As a type of architectural representation they are only able to convey form and its characteristics — light, shadow, scale, material. This unfortunately constitutes a pastiche of the potential for architectural expression because it cannot articulate the other half of the equation: space. To look at a plan, section or rendering and point out a dining space, for example, tells us absolutely nothing about the dining *space*. Rather, it tells us that there is a room in which it is thought dining could occur, and it is also a blatant misuse of the word space. Space can only be articulated by sound, and therefore to try and have a discussion about space while looking at an image becomes a kind of irrational behaviour.

The following timeline of images

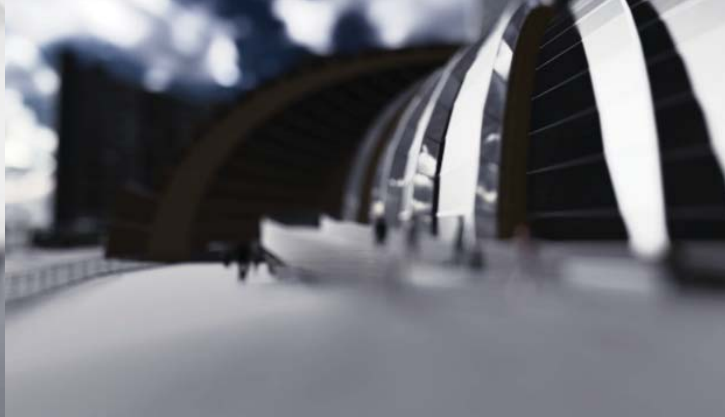
represent the breaking-down of a sequence through the building that was designed to explore this thesis work. They have been included in this book for two reasons: the first, is to appease our visual curiosities as they relate to architectural form. Although treated with fairly harsh criticism, it should not be thought that the goal is to throw away visual representation, but merely to point out that it has overstepped its bounds when it comes to space; thinking that it has domain of expression over it. The second reason is for juxtaposition. After having read through the sequence of images in silence, you will be invited to experience it together with sound in the form of a soundscaped video on the internet. The difference should be glaringly apparent as to the ability of sound to express the architecture much more holistically.

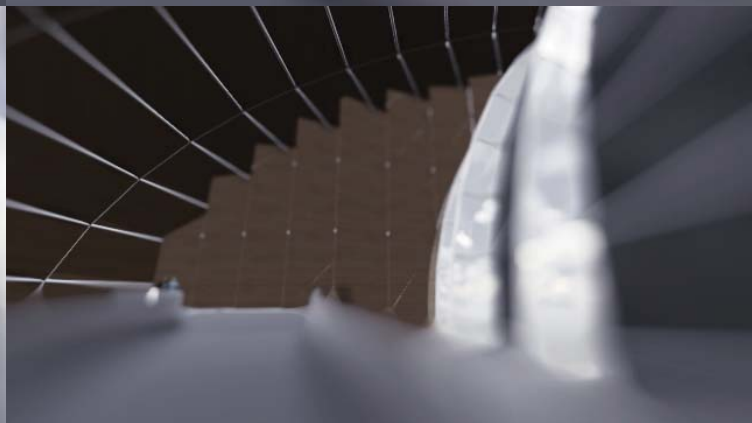
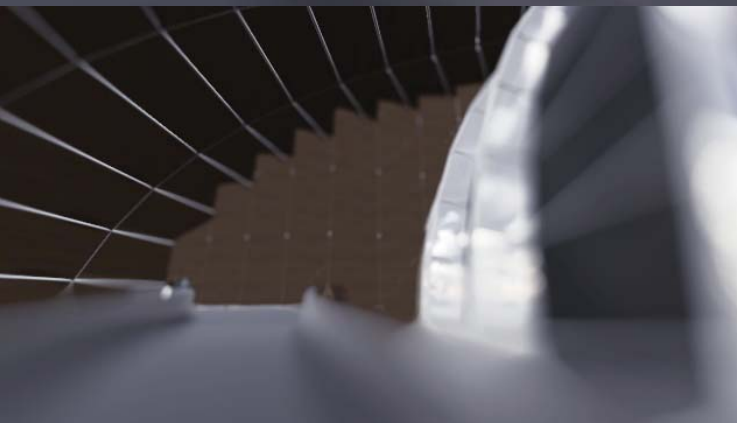
It should be reiterated here that sound does not express space in a physical way. Sound is perceived in reaction and relation to architectural form, material, texture and scale, but space is not because it is metaphysical. This is a nuanced and subtle distinction that is often overlooked: that sound does not articulate physical space, but rather affects ontological spatial conceptions that we build in our minds and hence act upon, or feel through.

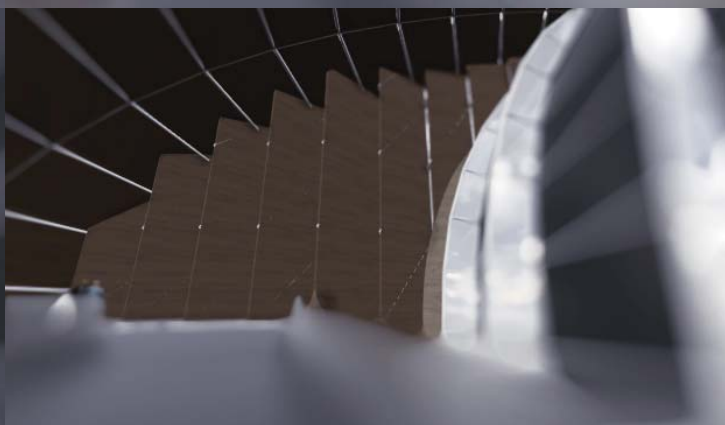
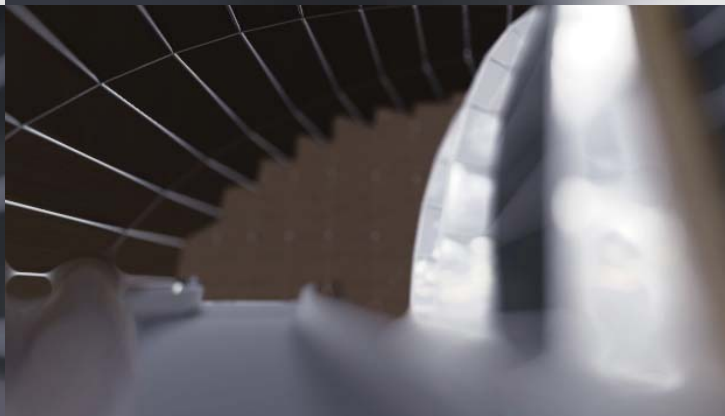
Please flip through the following pages and visually consume the images. You may find that at a certain point they undergo a change of value; initially interesting but subsequently vulgarized and meaningless. This is intended, and is being done to force the architectural image, as such, into a meaningless state. This is perhaps more of parallel meta-critique going on outside the confines of this thesis, but it is also useful to set up a closer dichotomy (or juxtaposition) between a silent sequence of imagery that can be included in print, versus a multimedia representation that includes sonic expression, and to show how much is truly missing by ignoring sound as a tool for architectural representation.

BEGIN



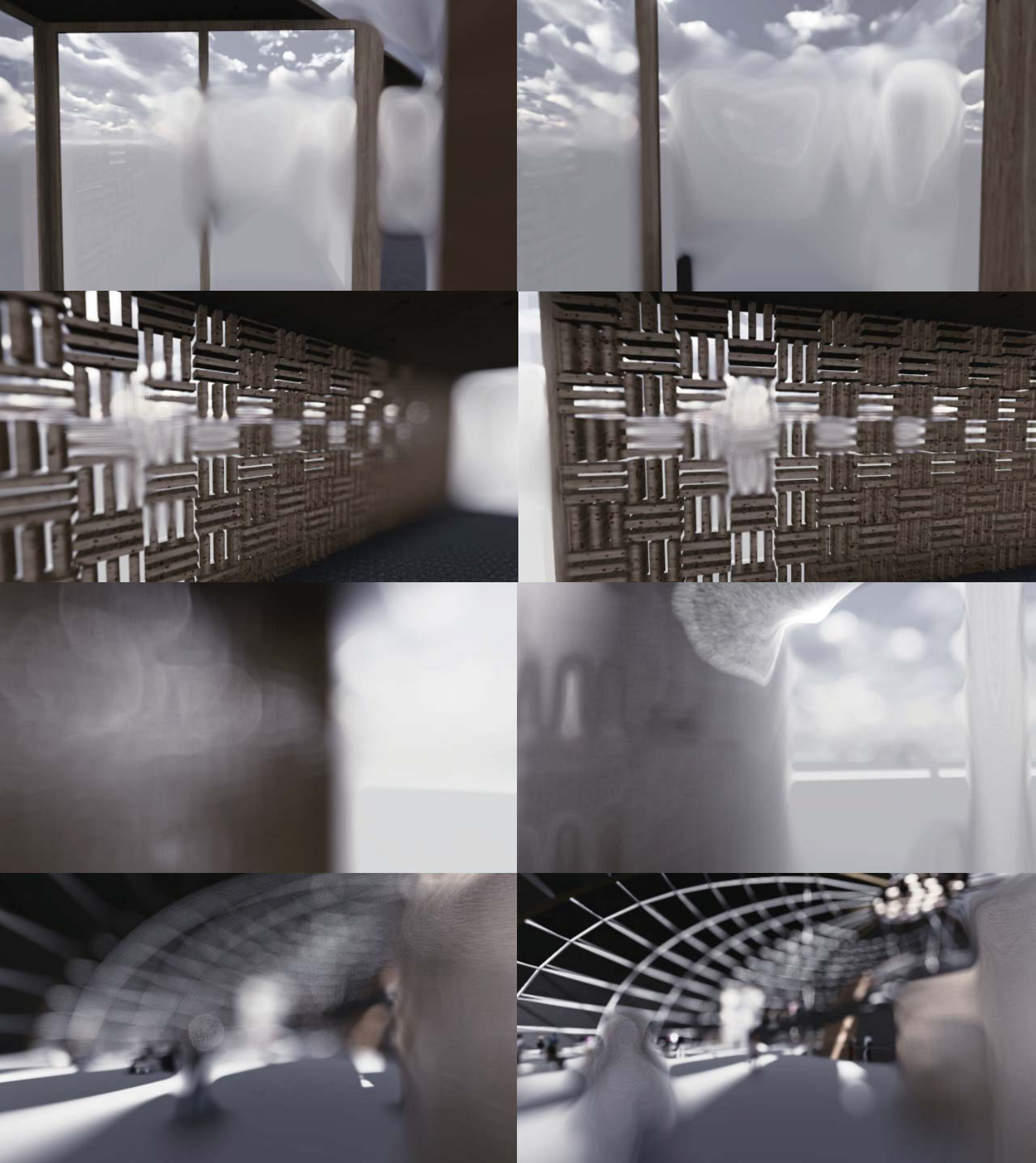


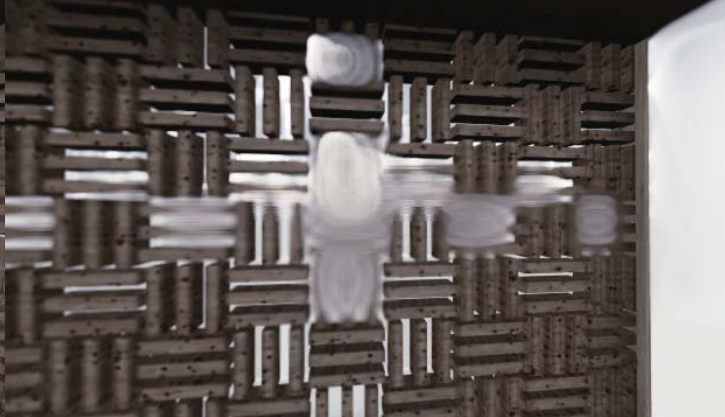
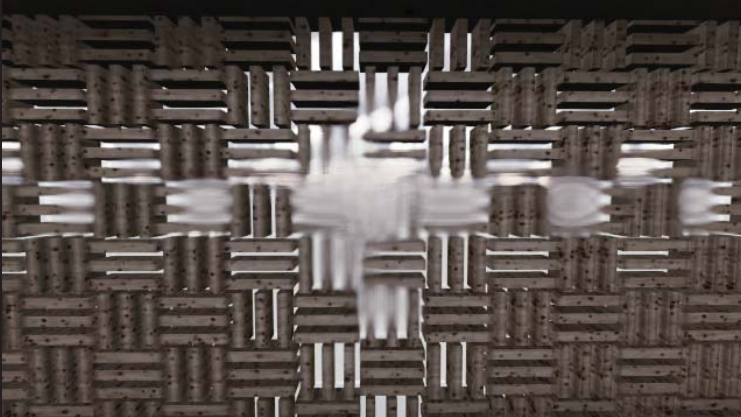
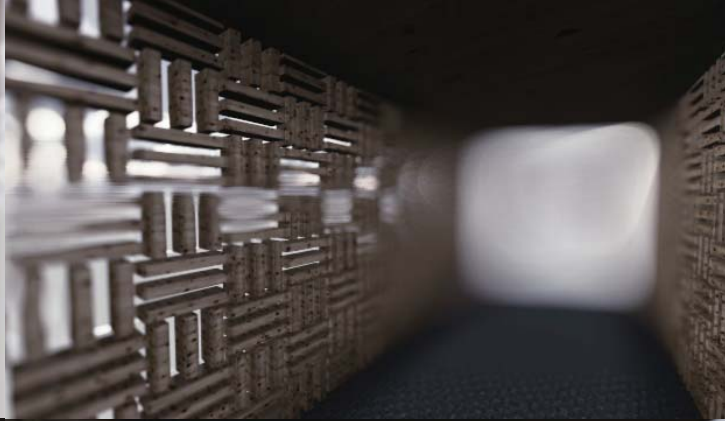


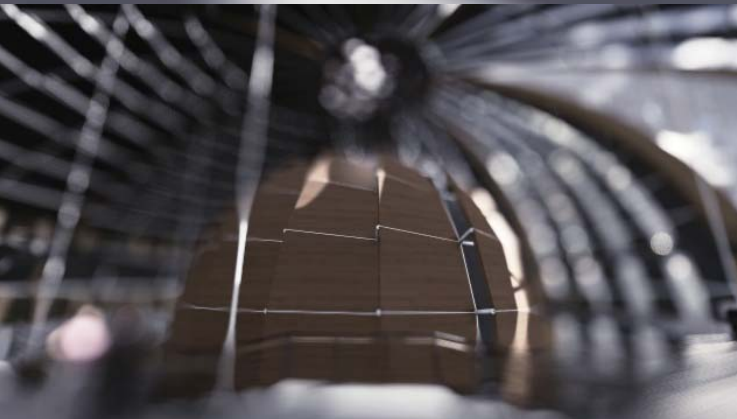




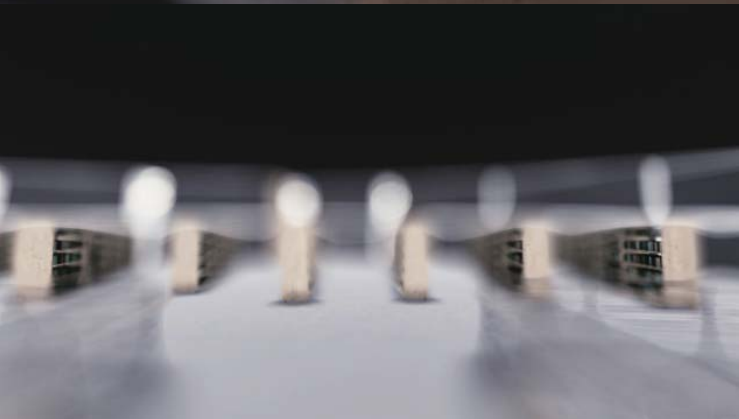




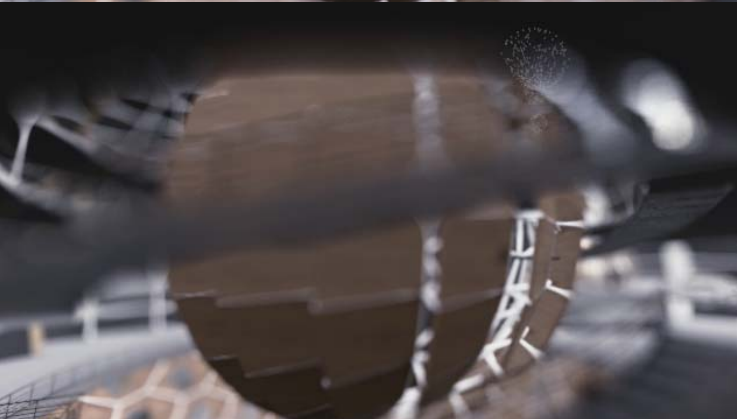




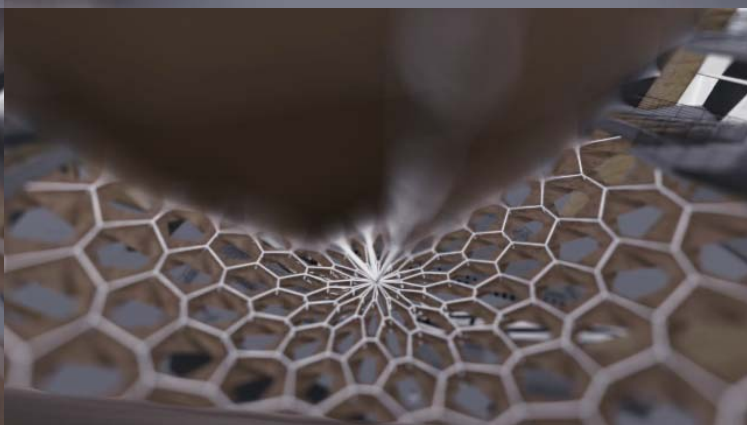
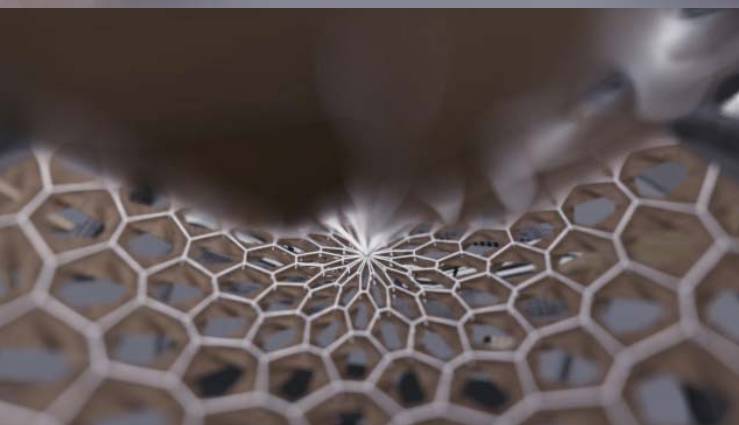
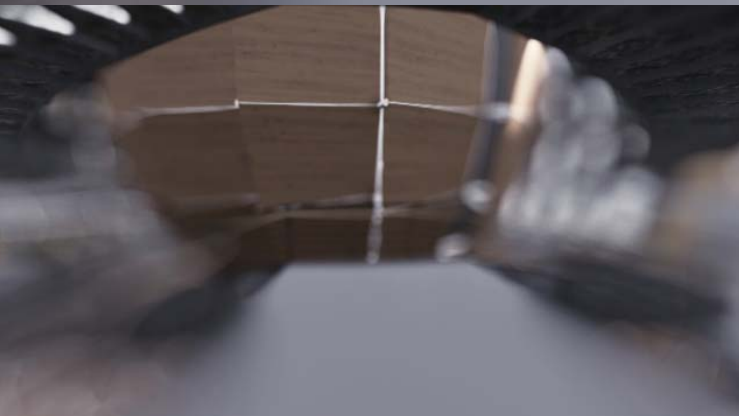


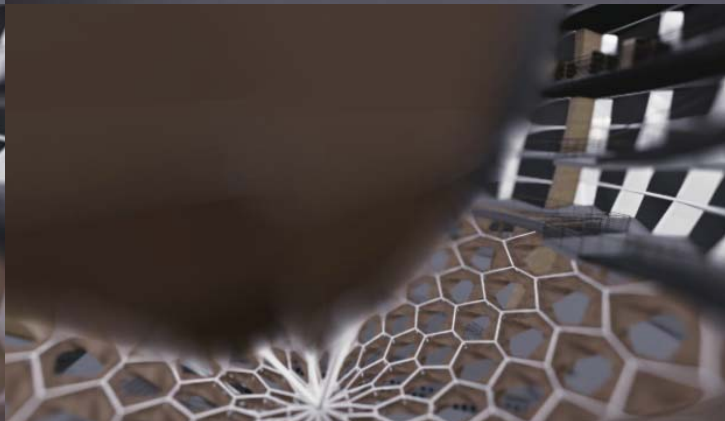
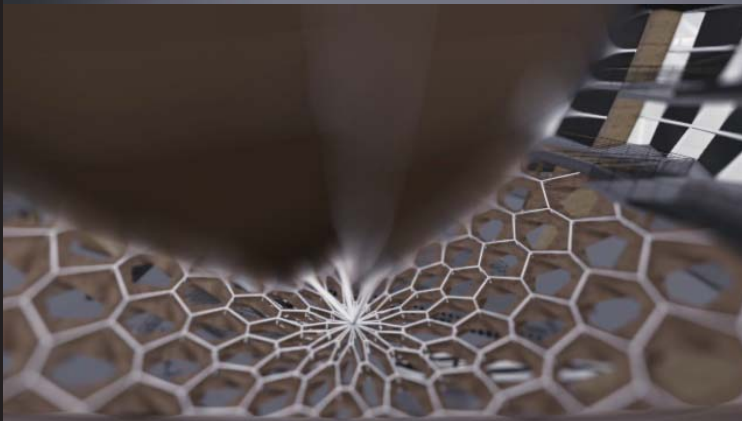
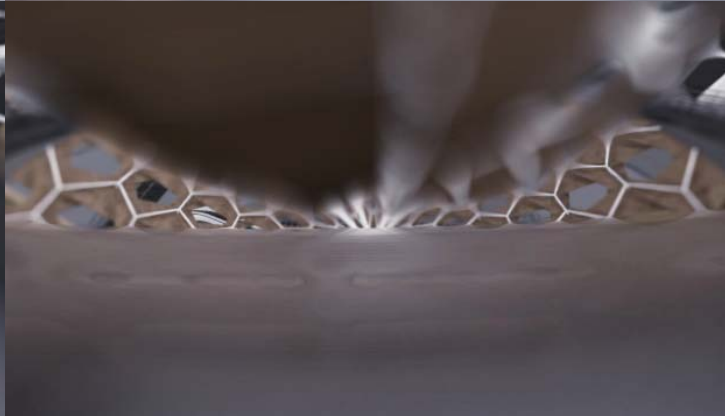




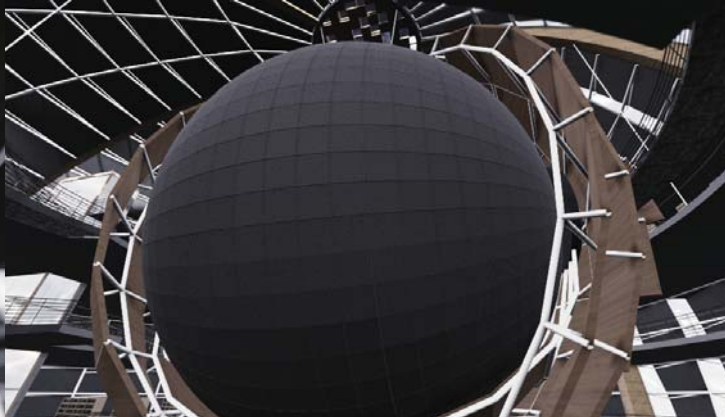


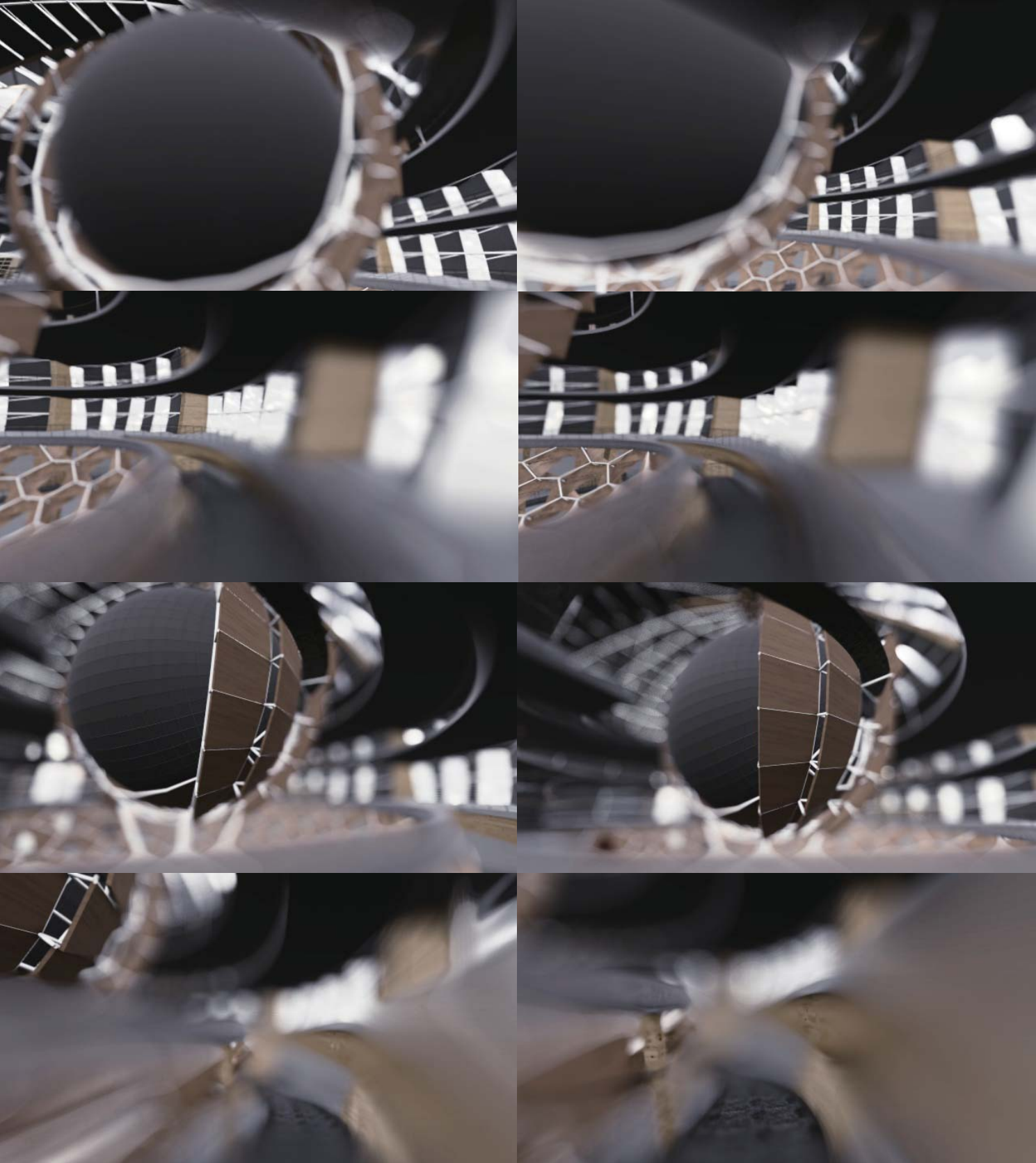


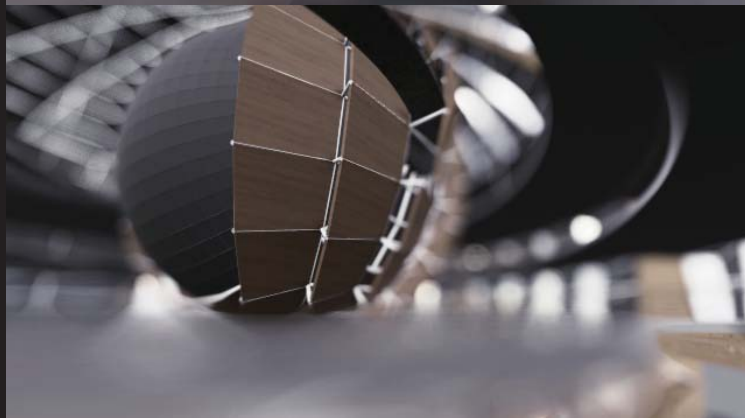


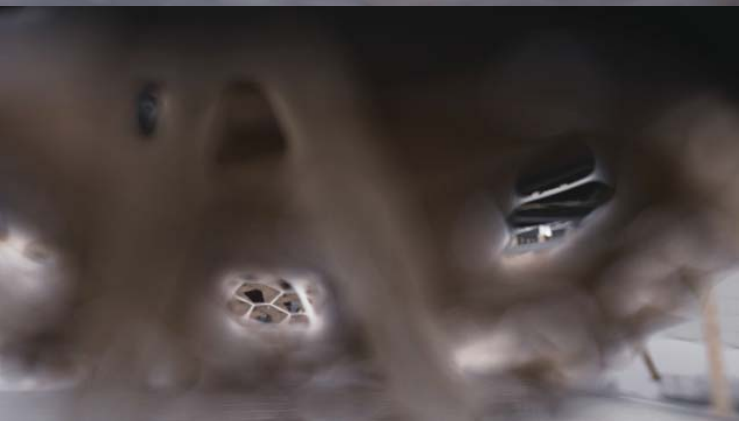


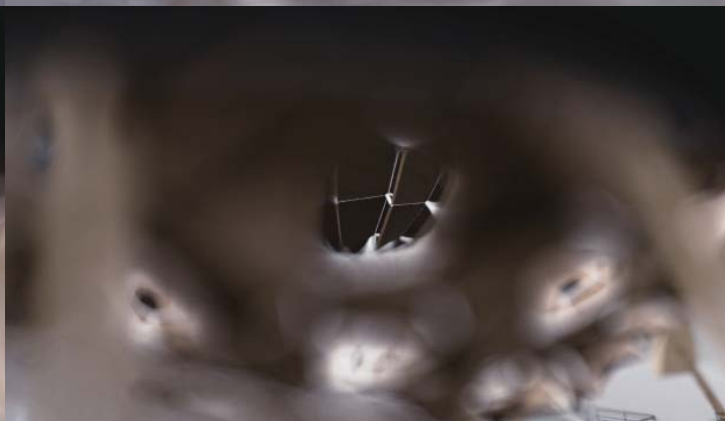


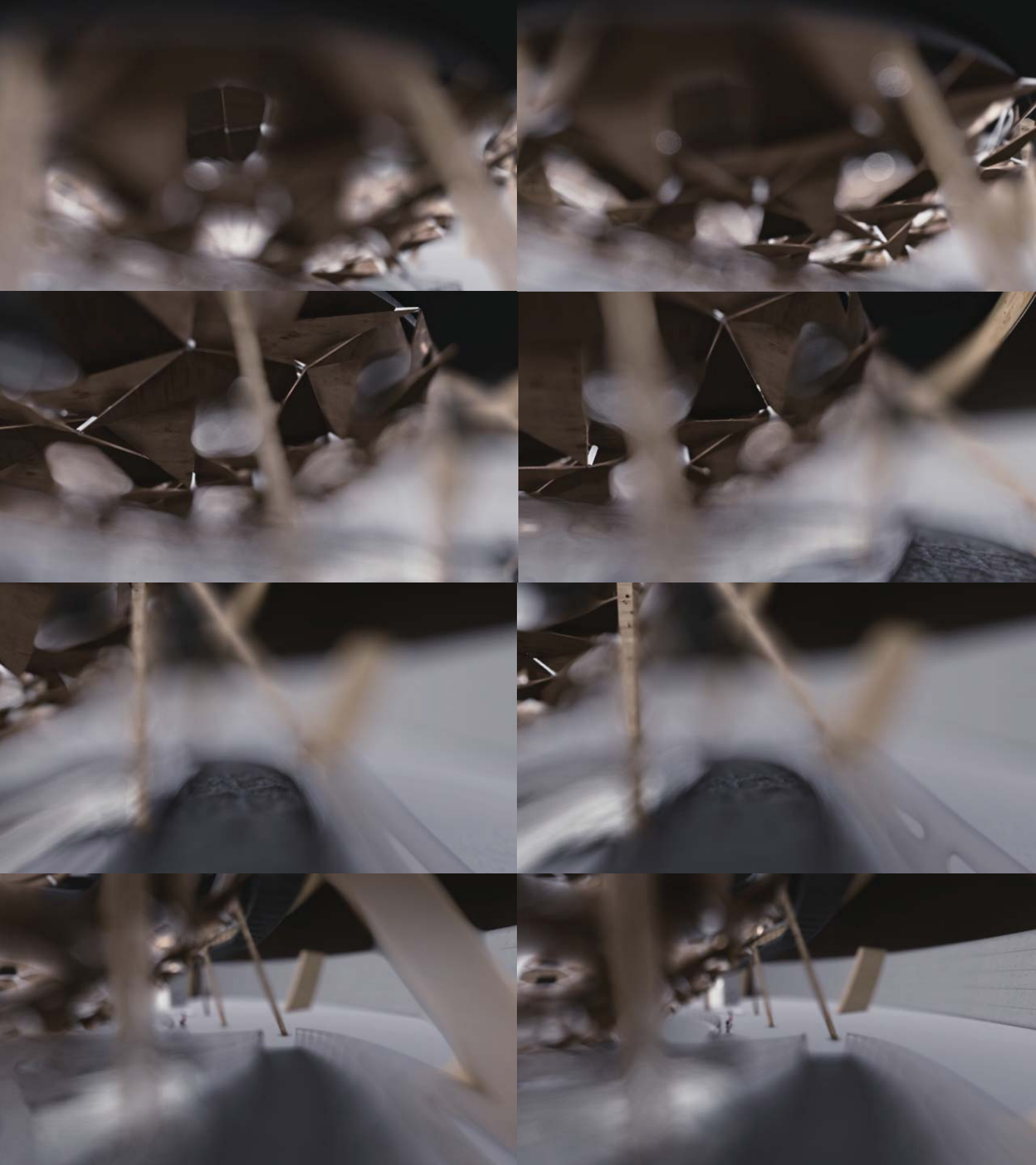






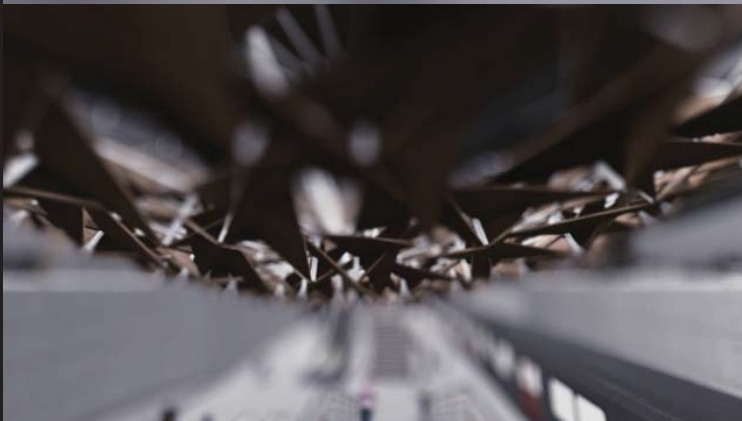






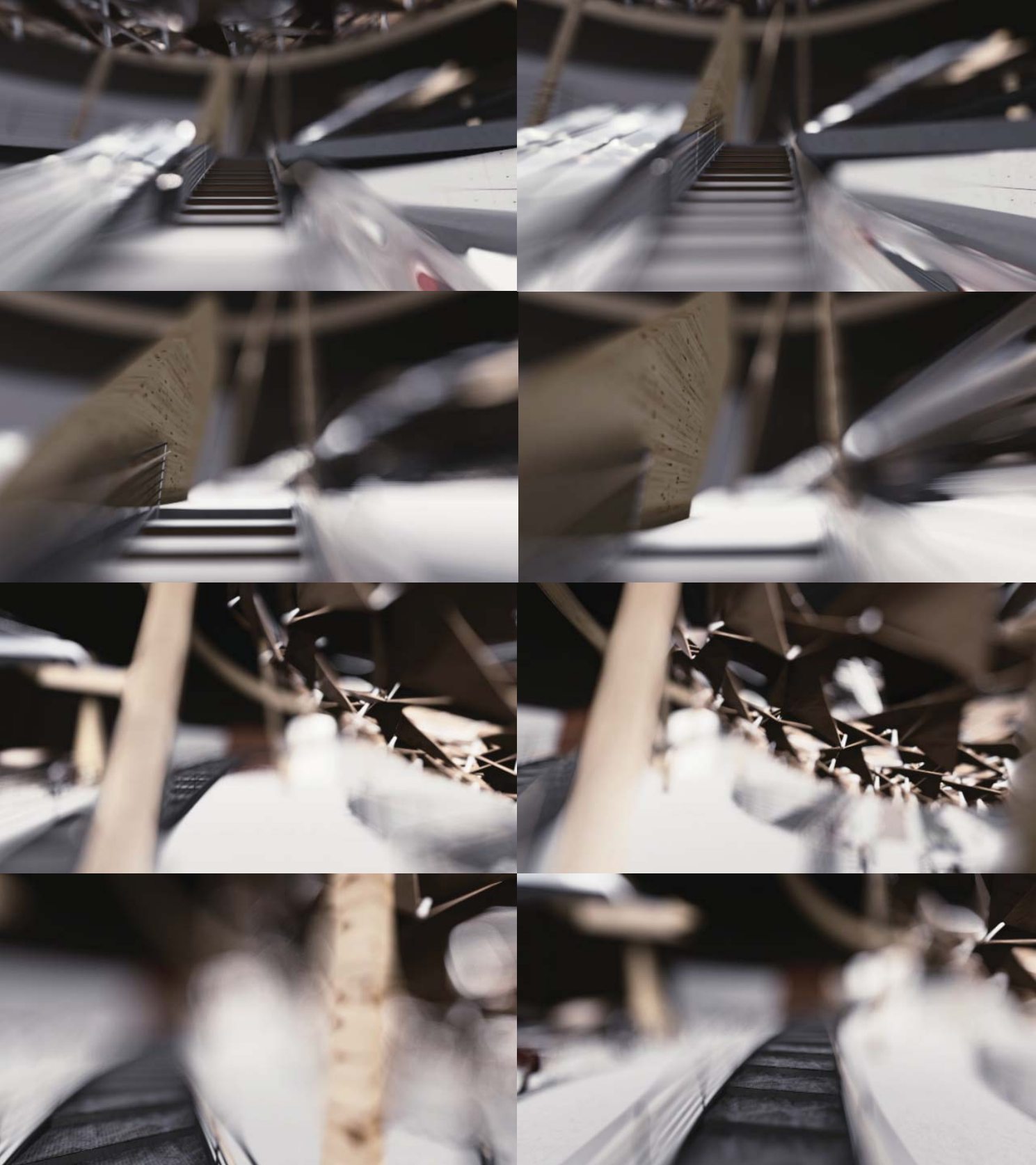


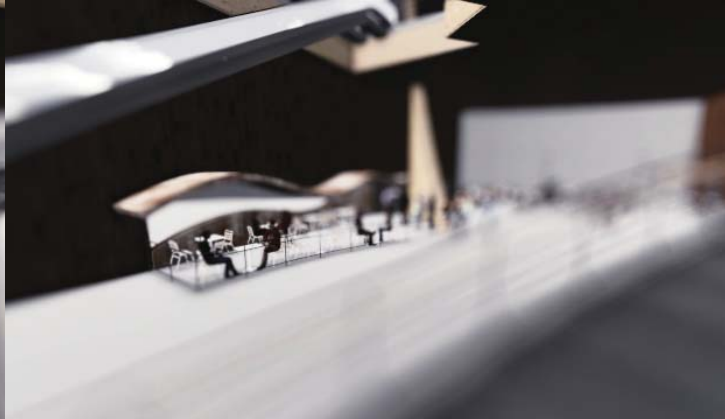










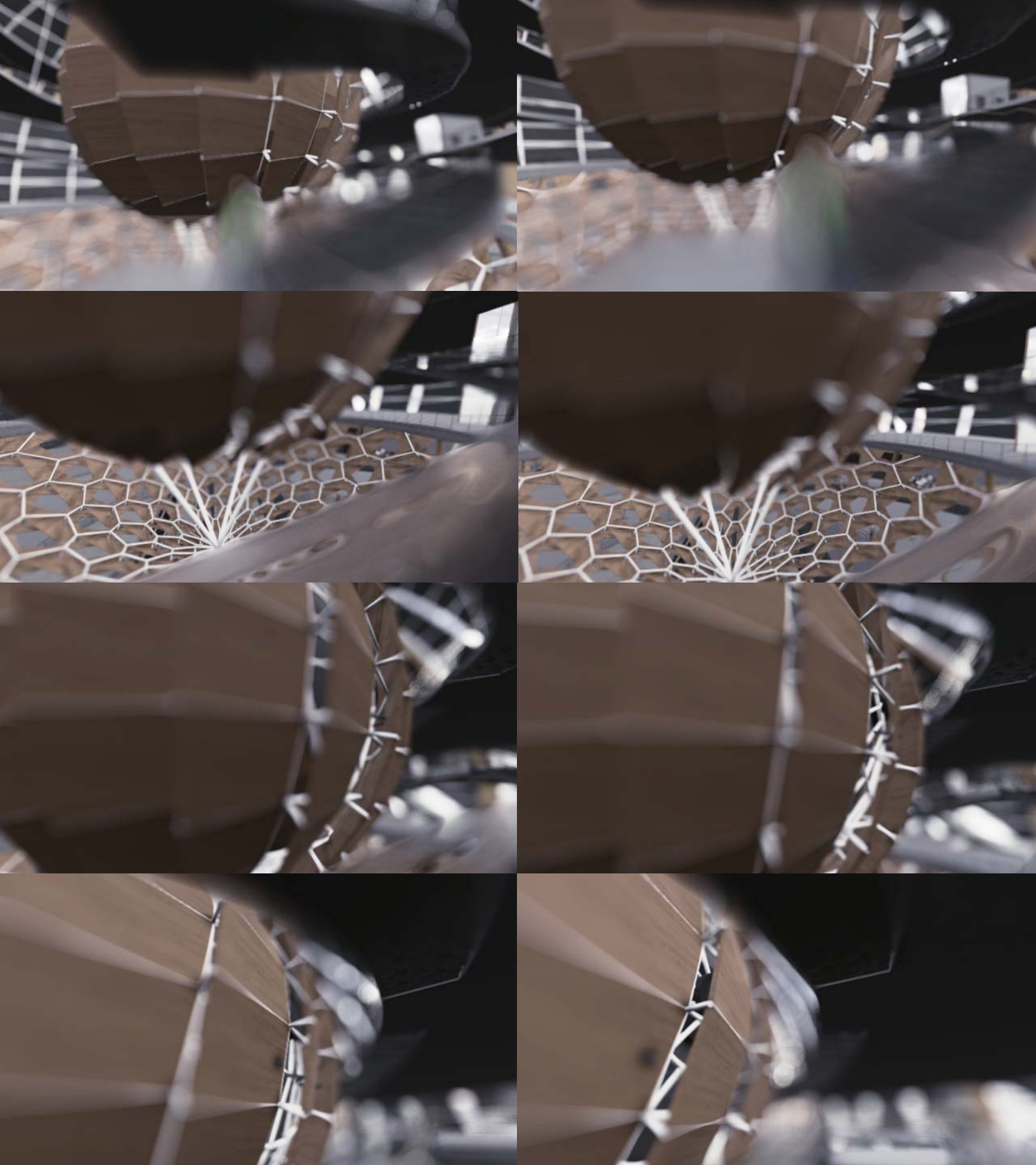




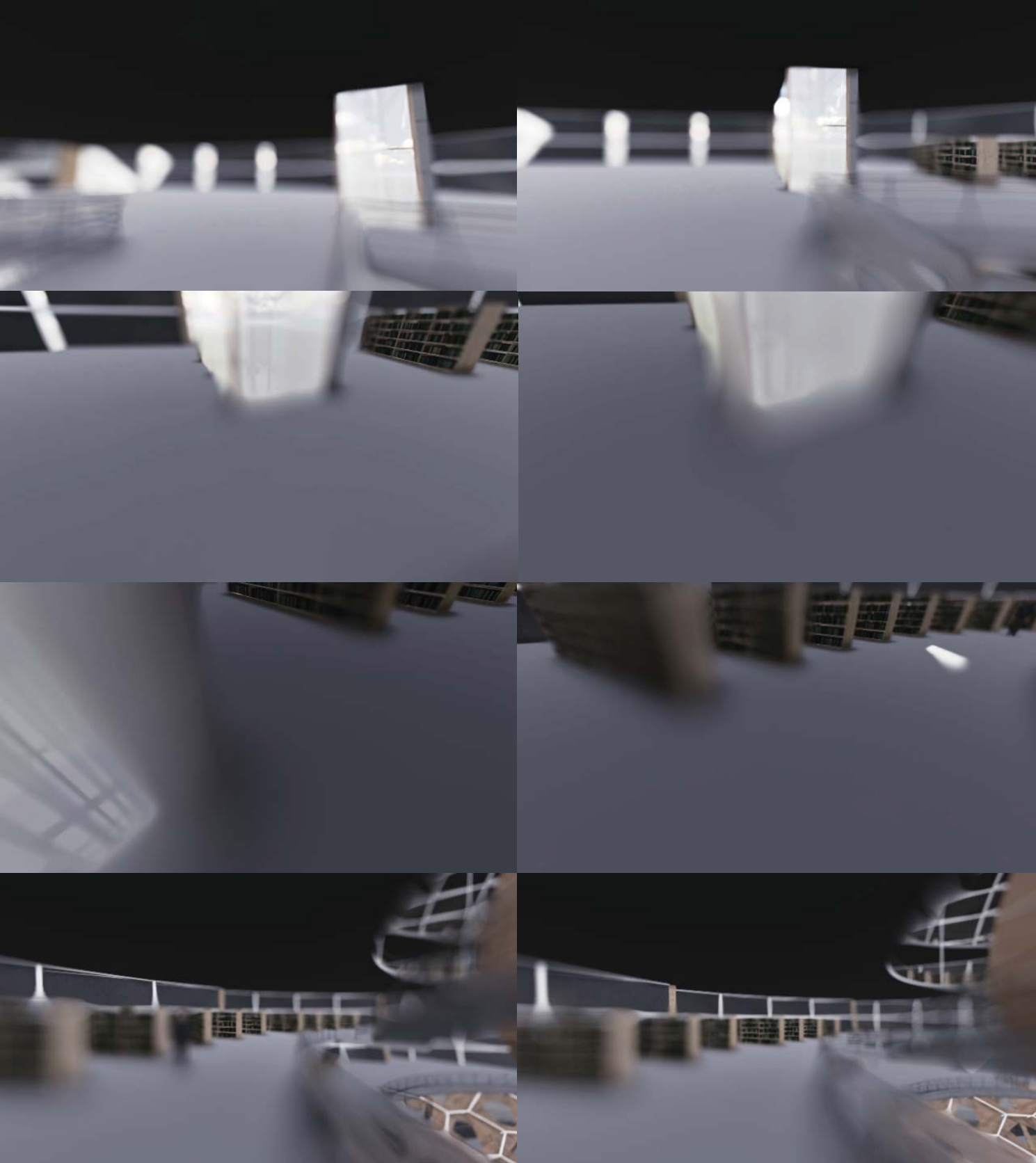


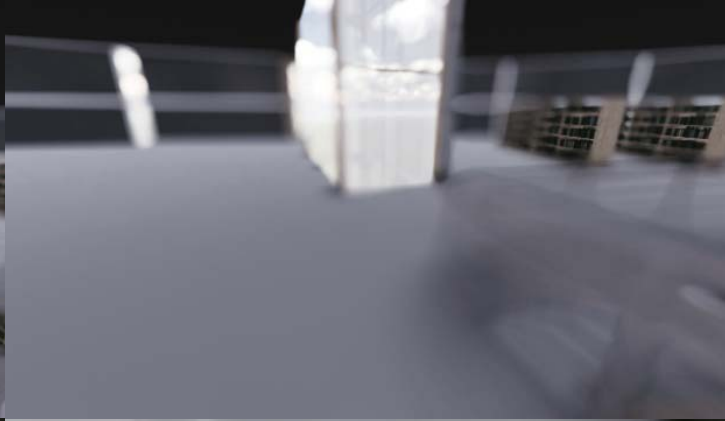


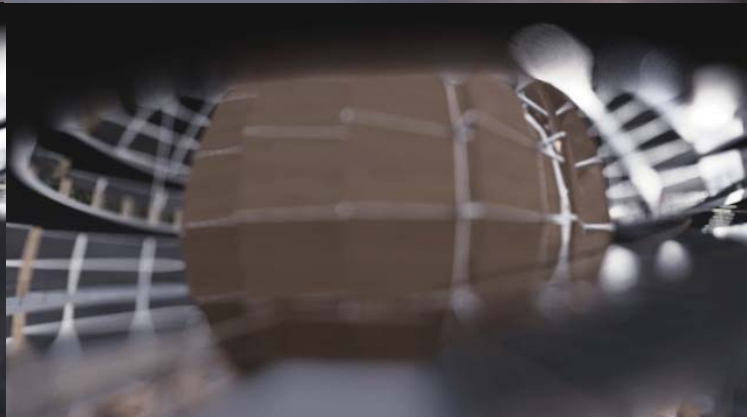


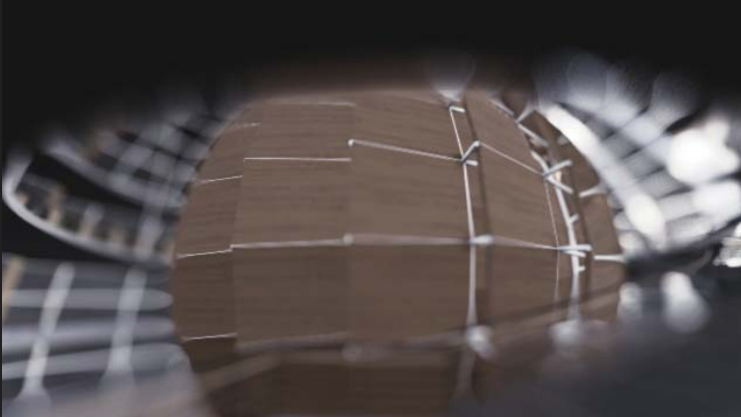






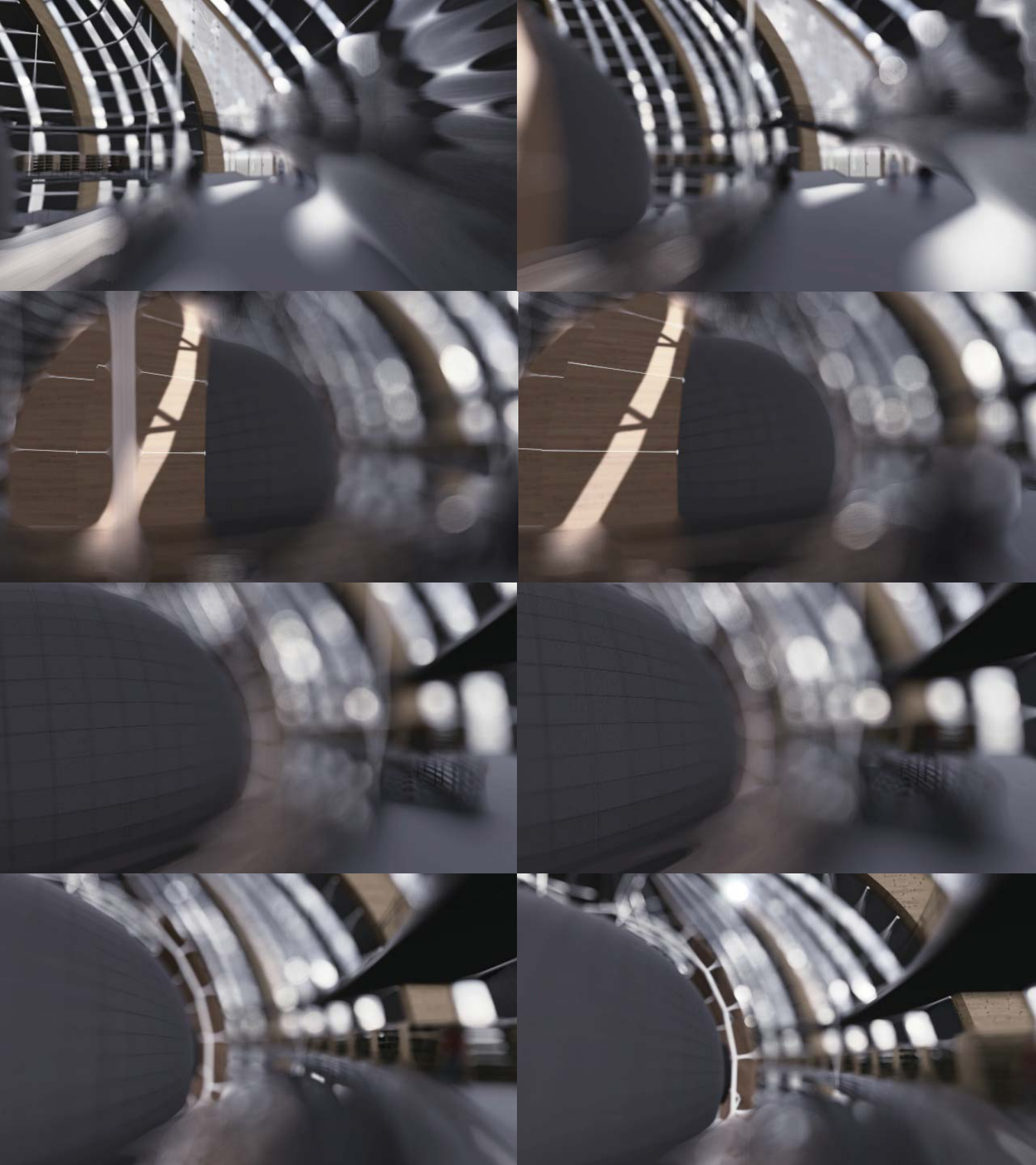




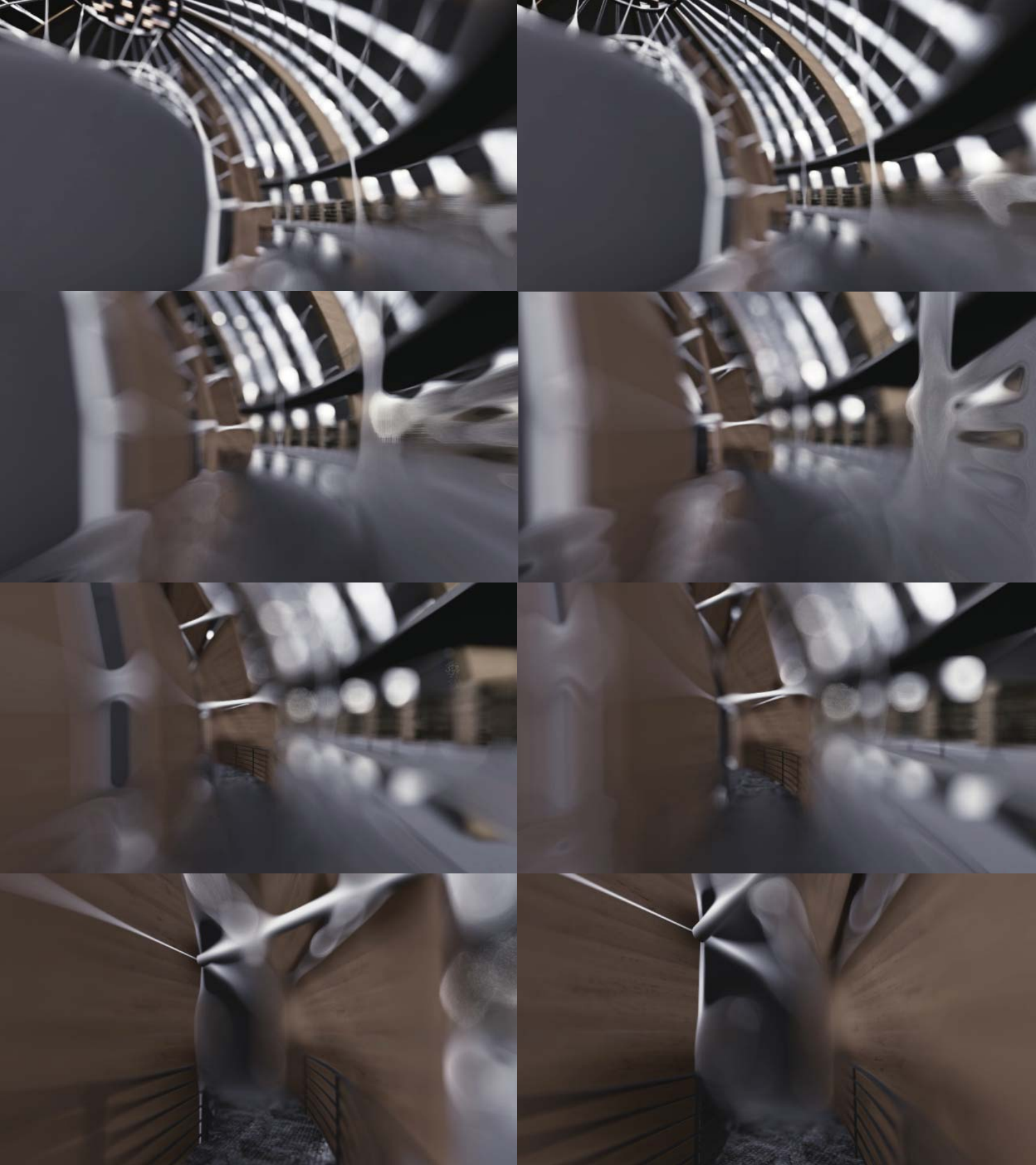


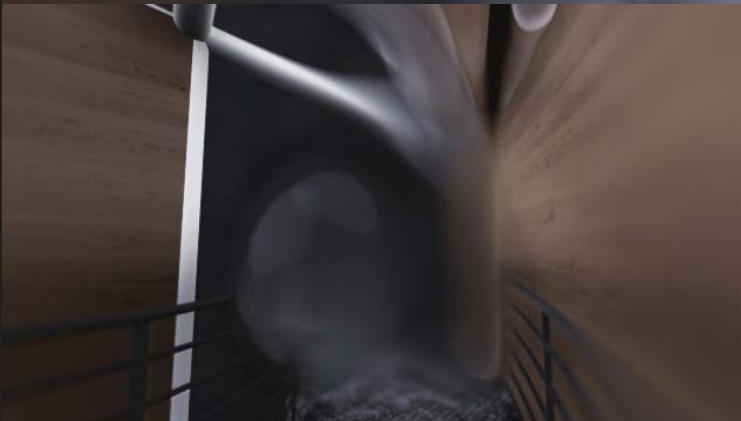


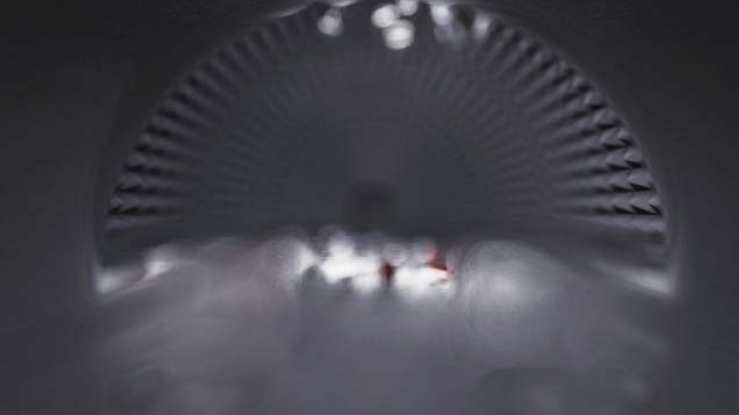


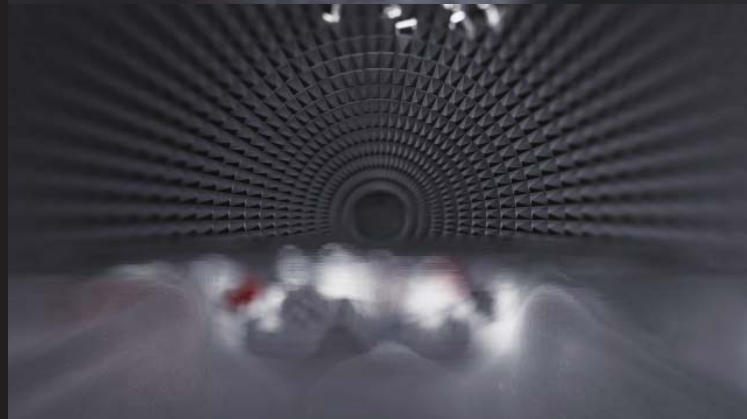
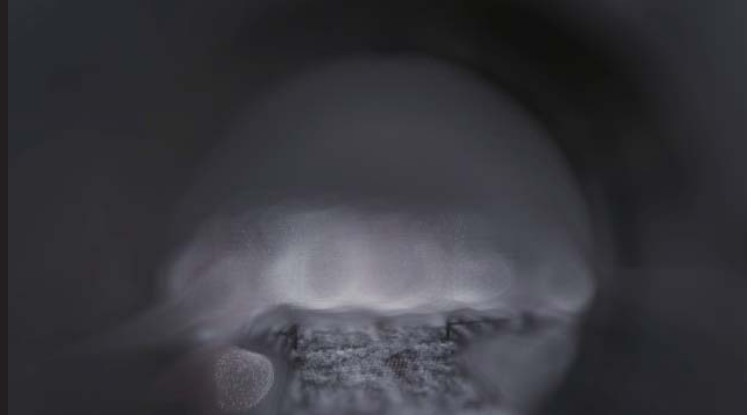


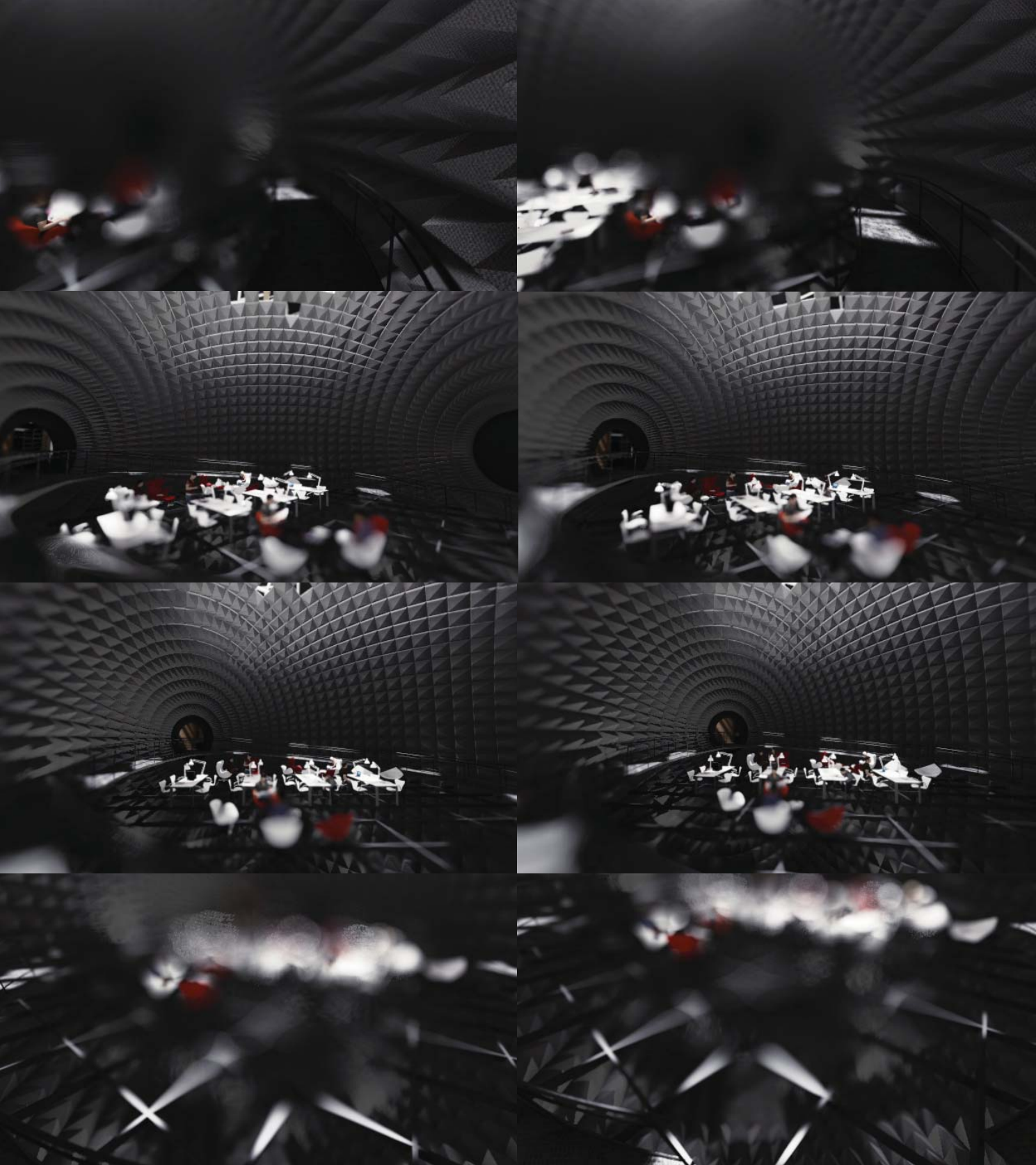


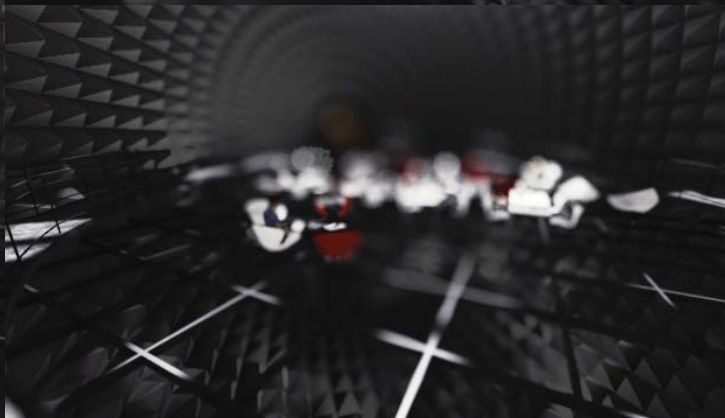


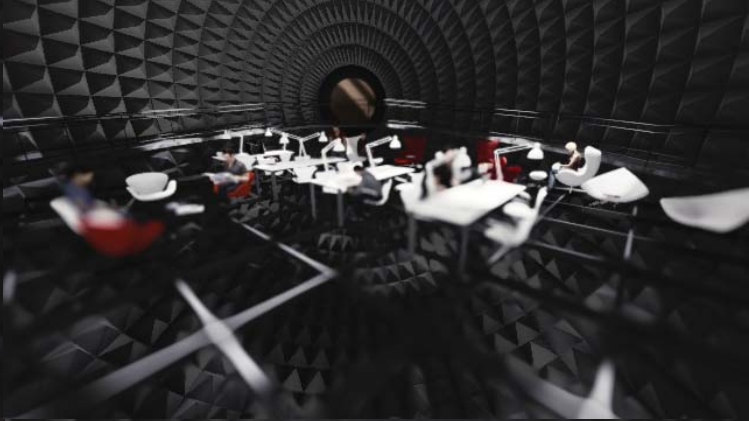




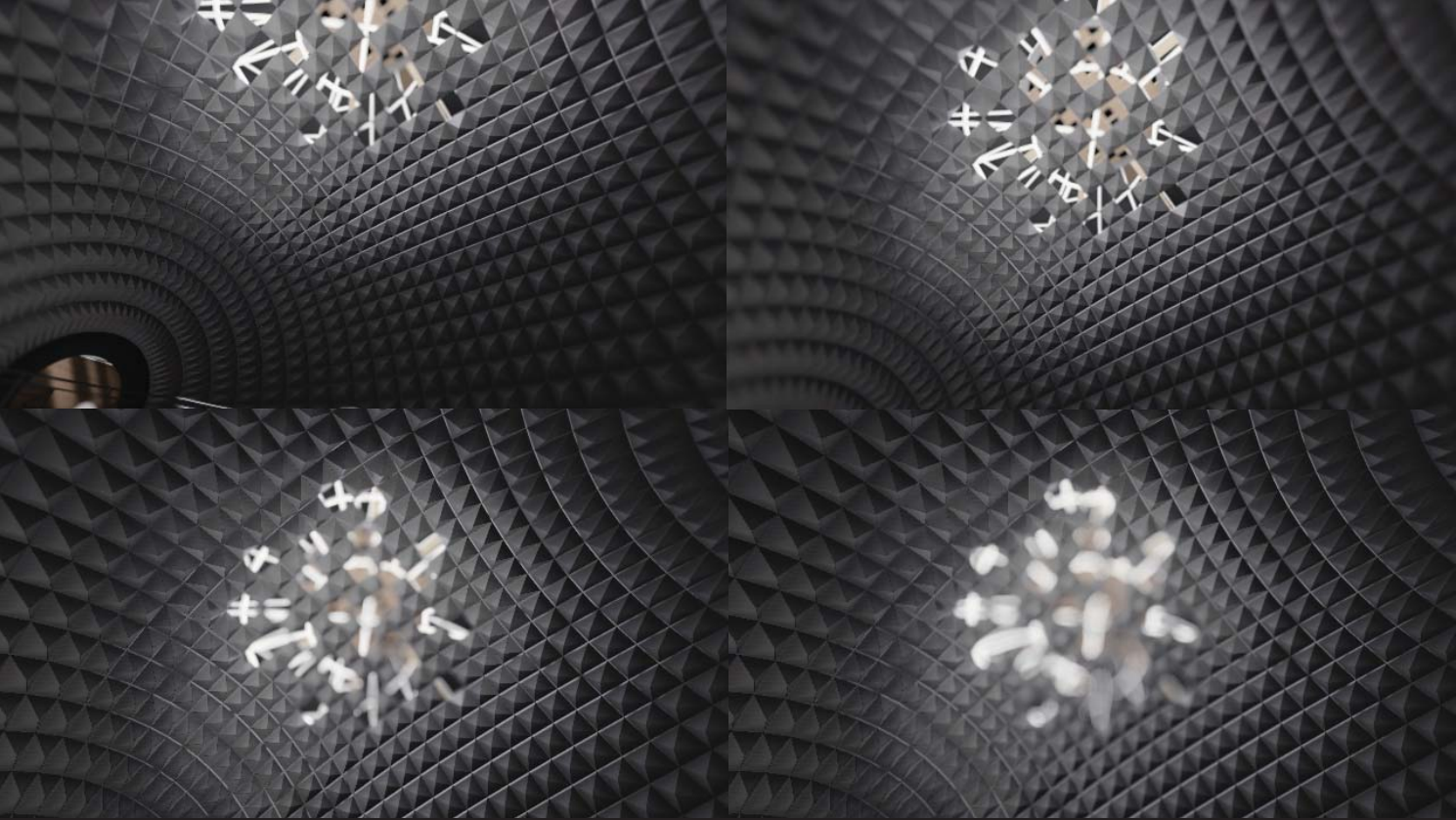


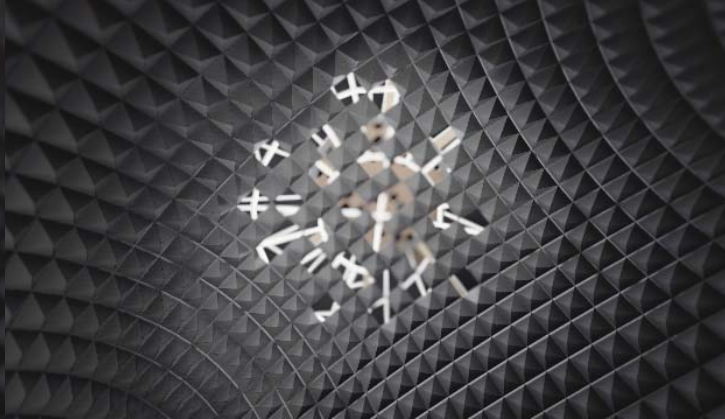
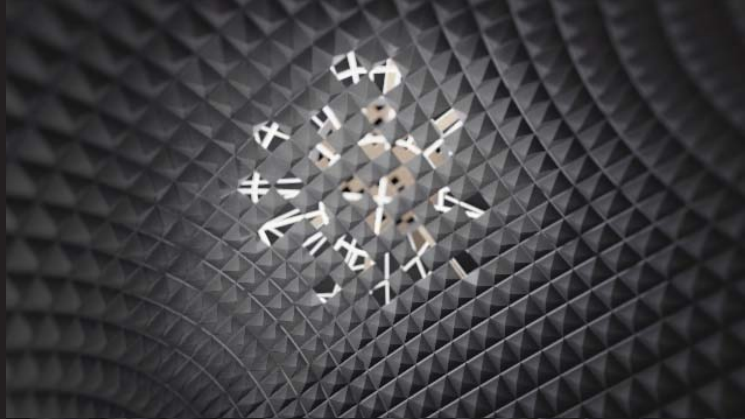




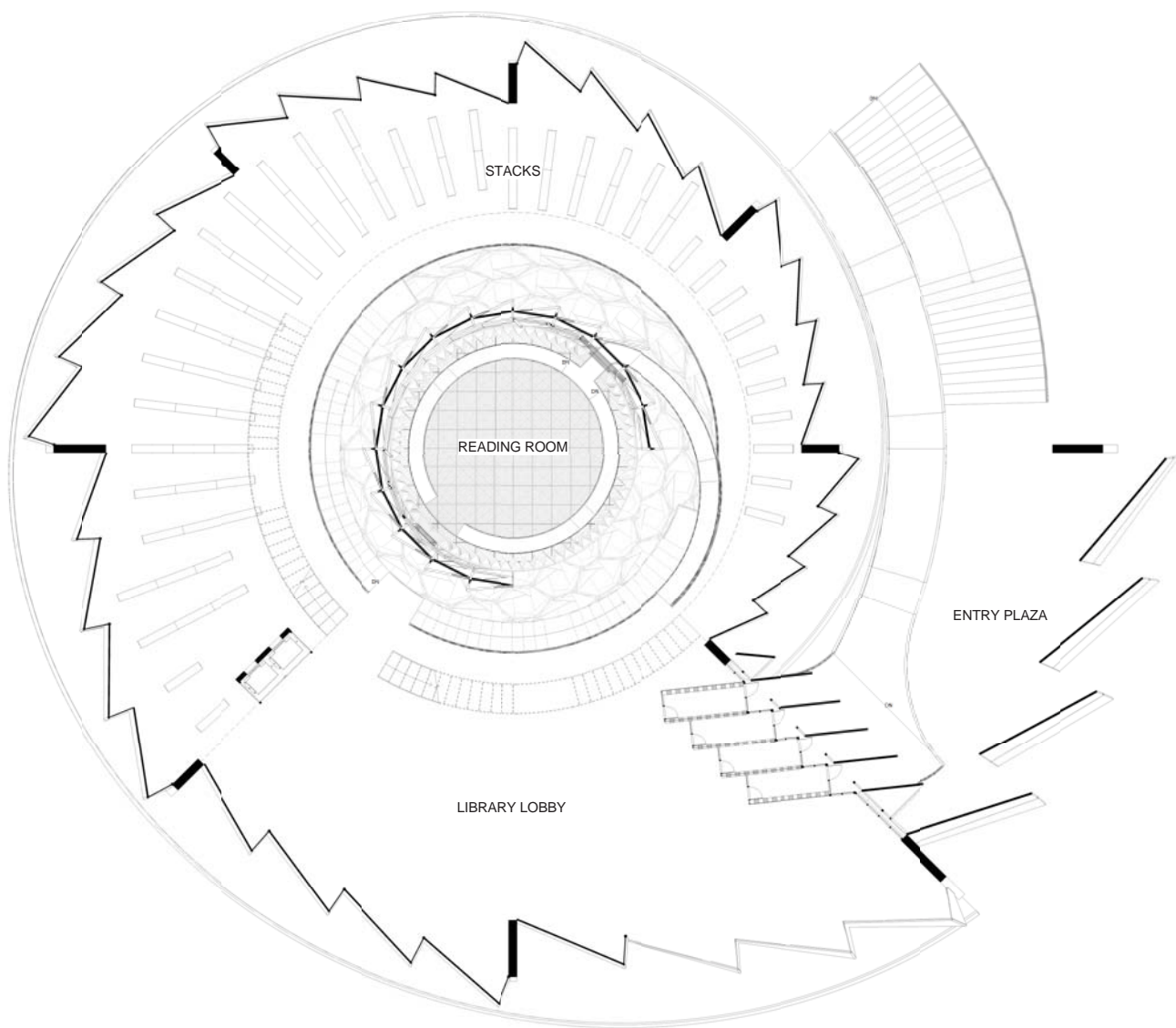




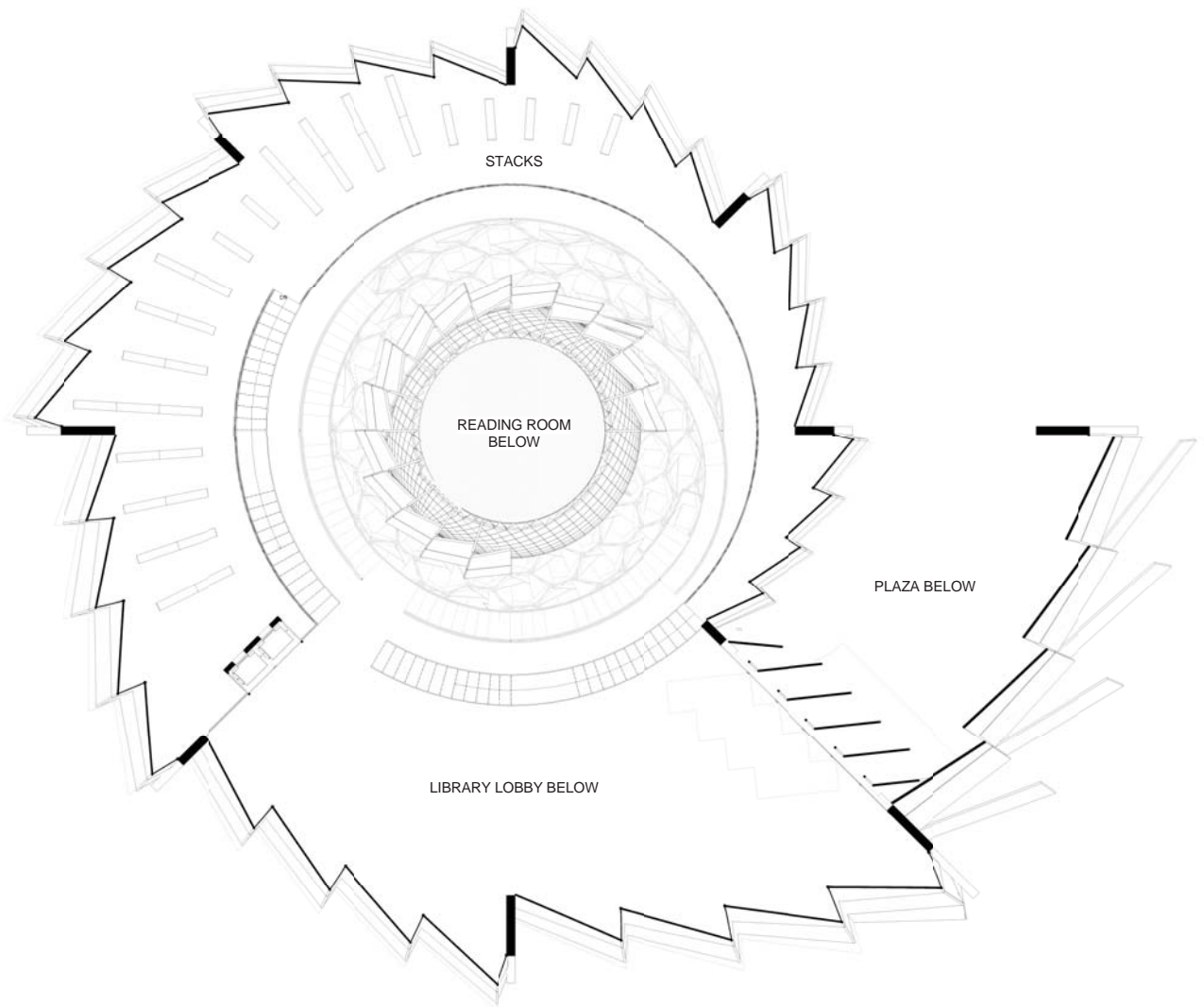




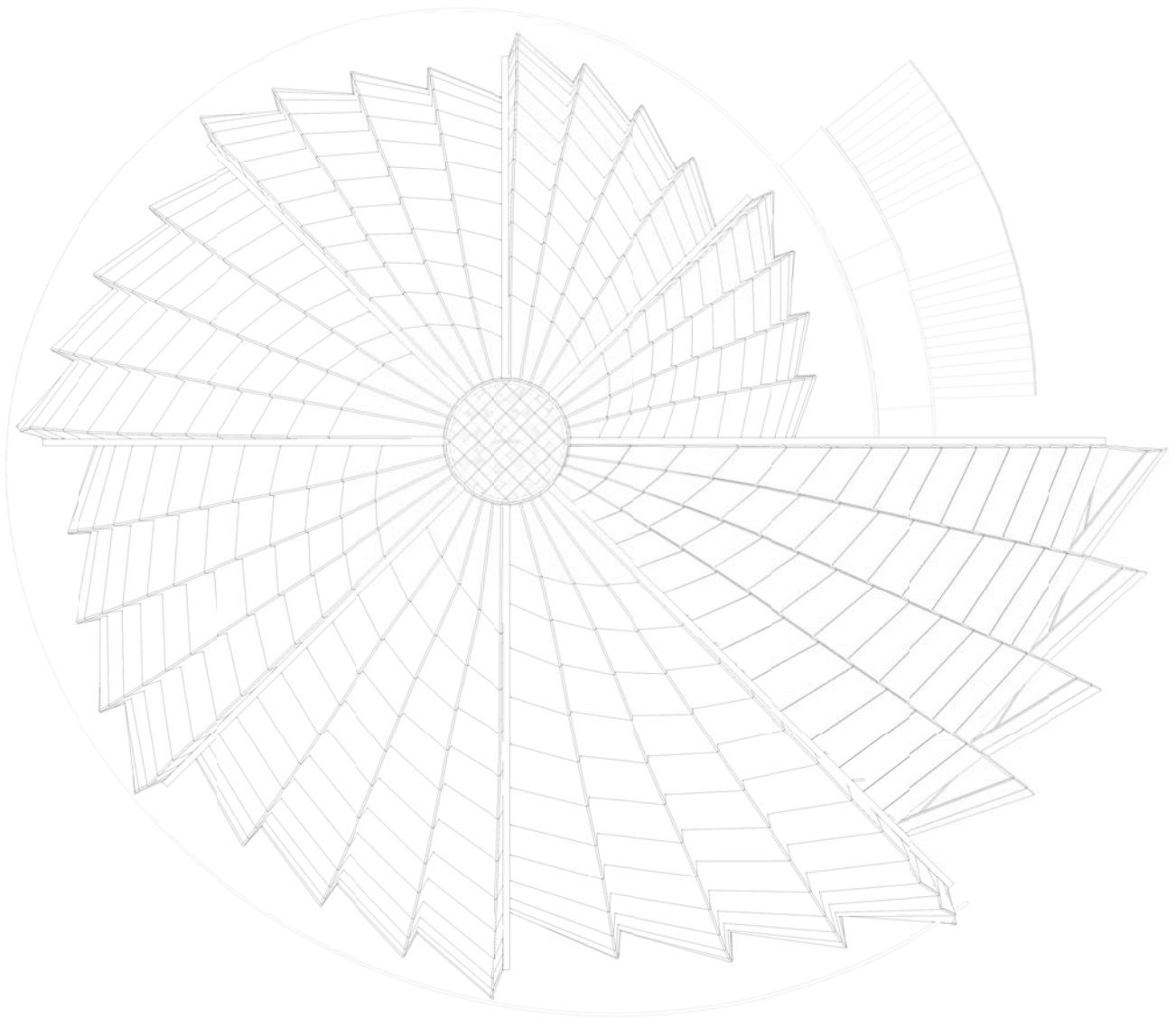
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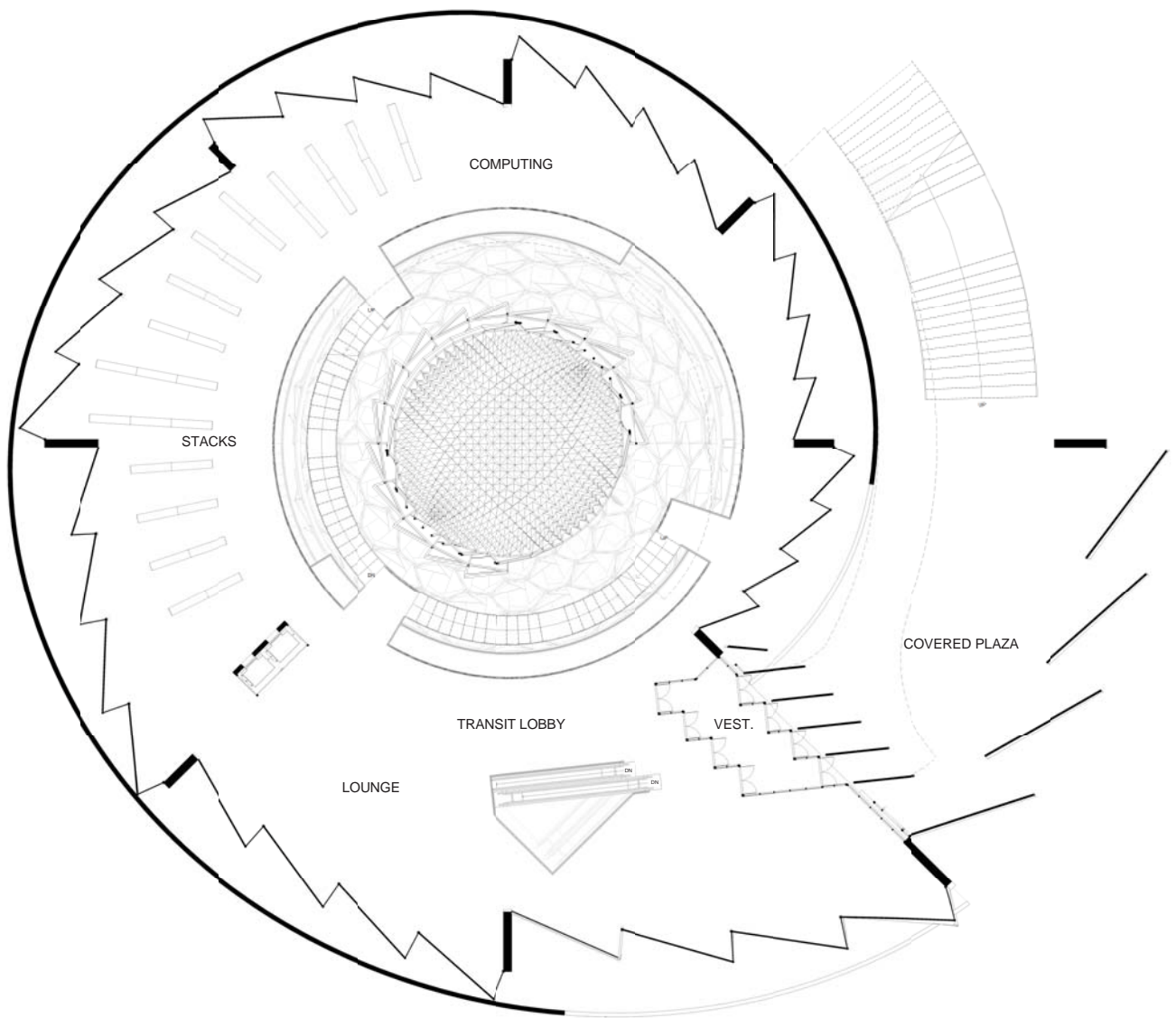
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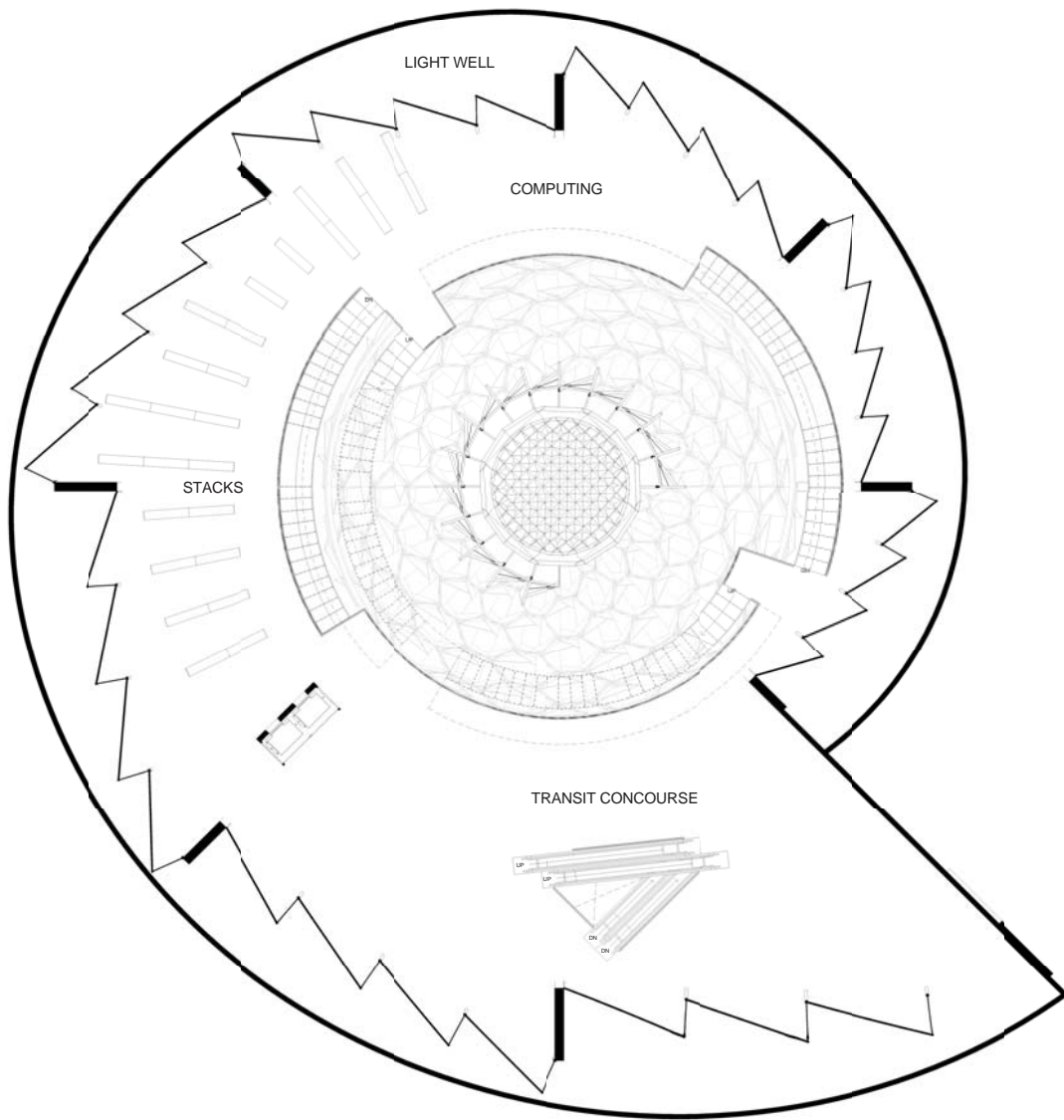
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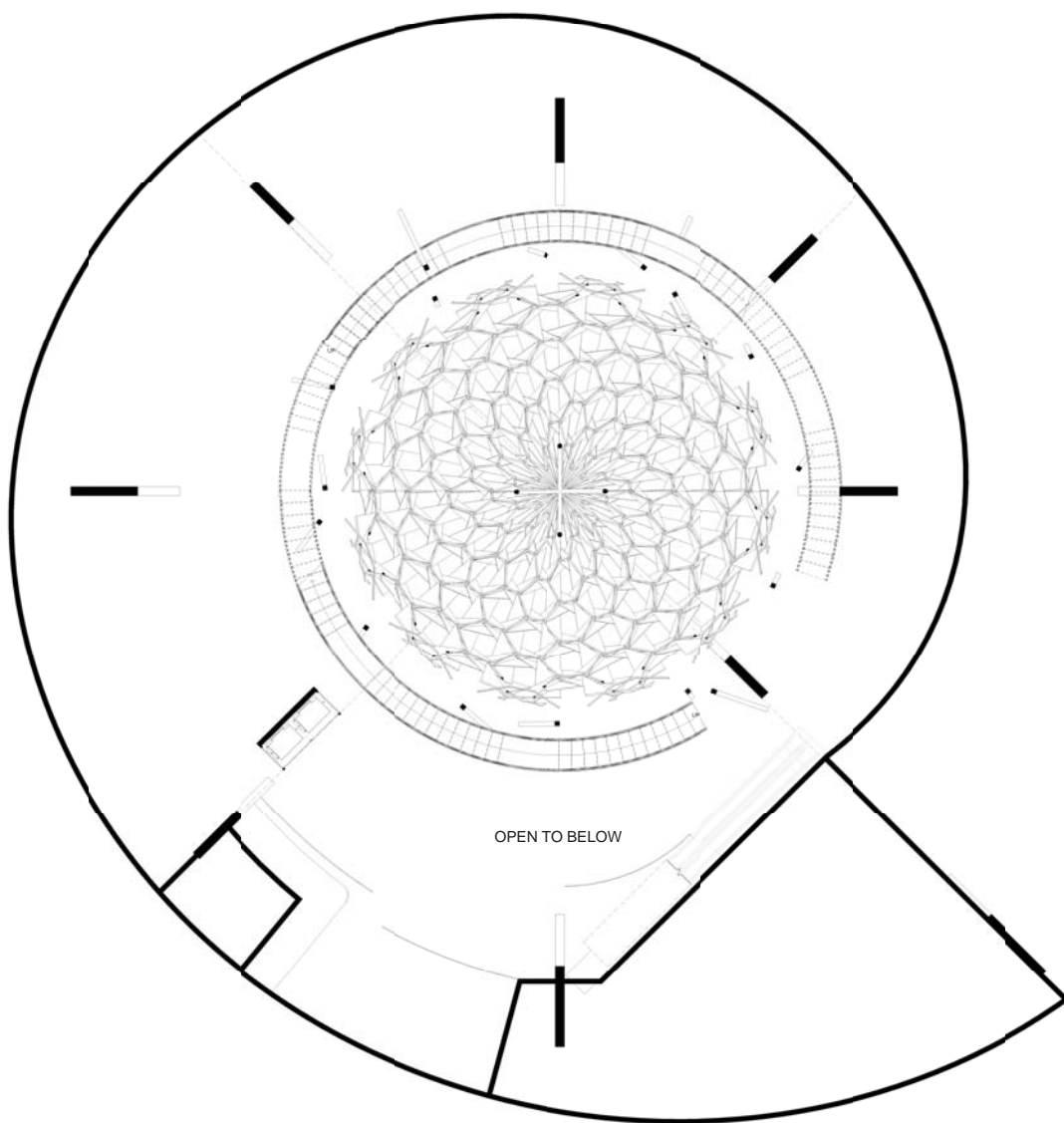
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FLOOR PLAN 0

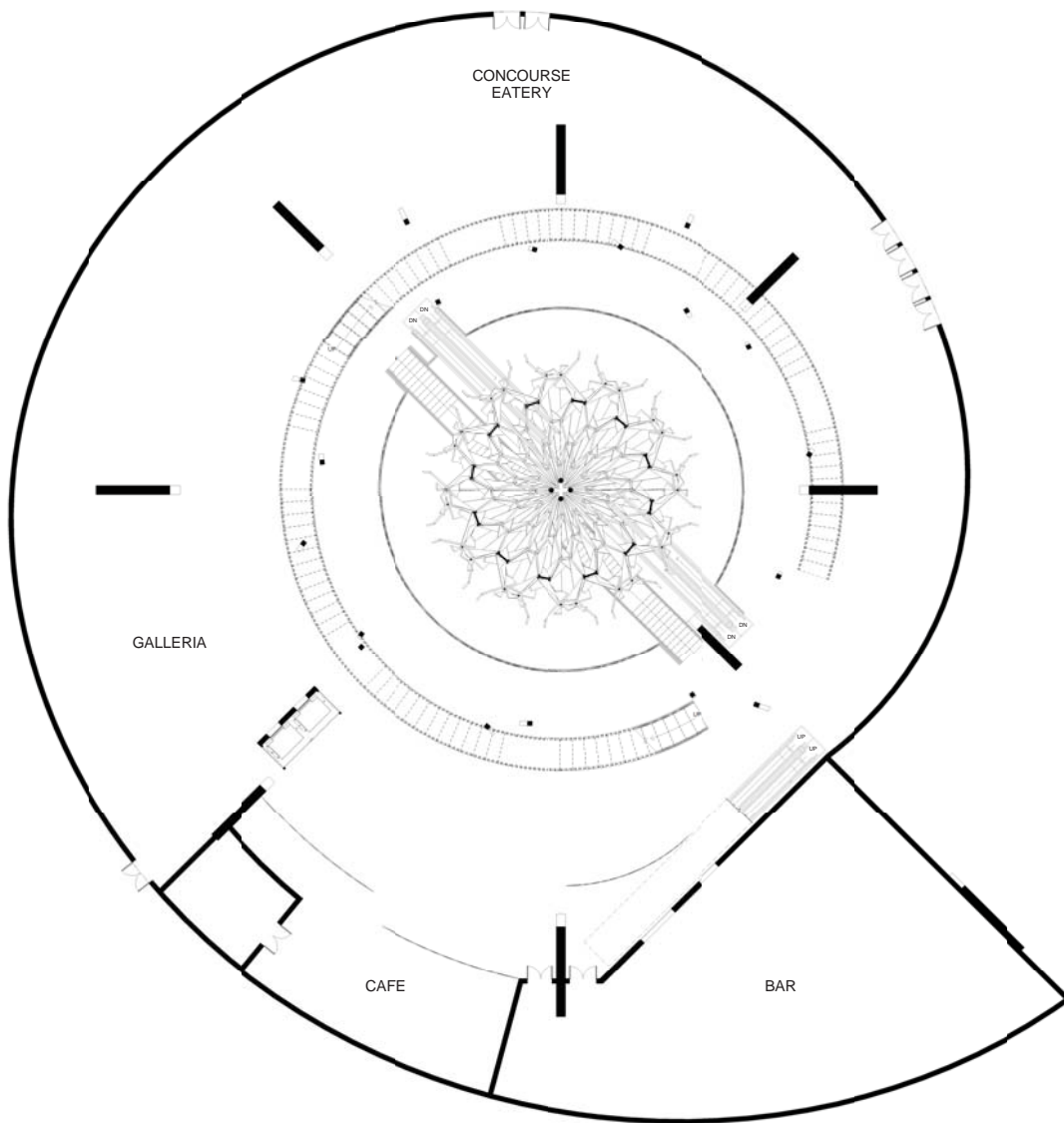


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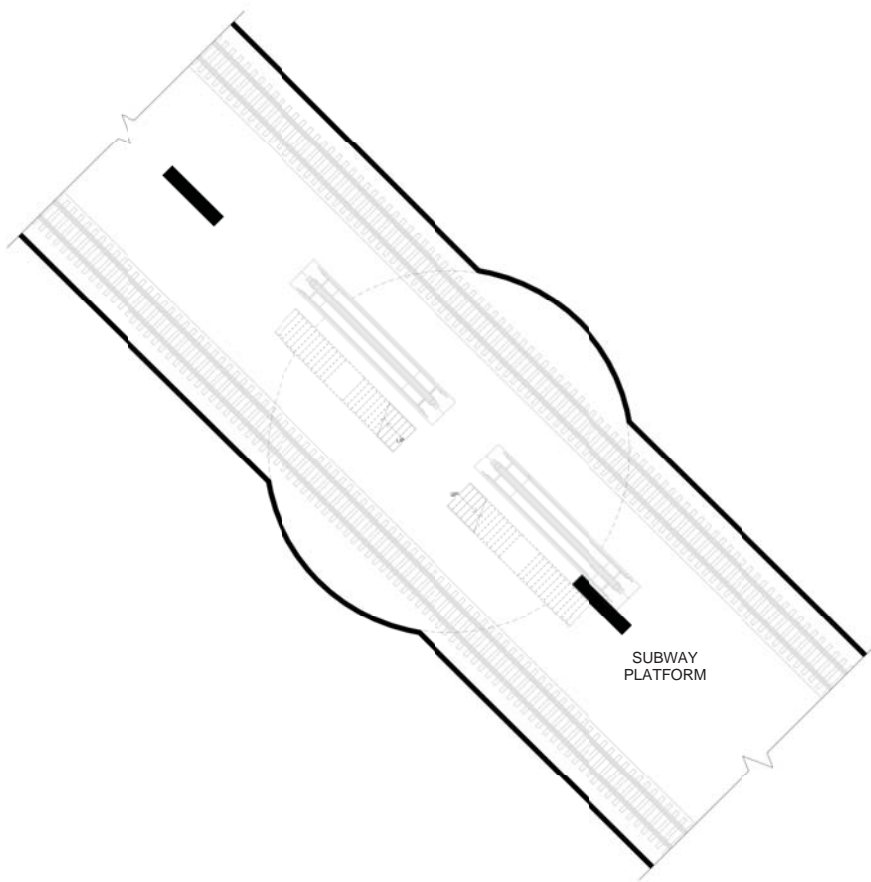


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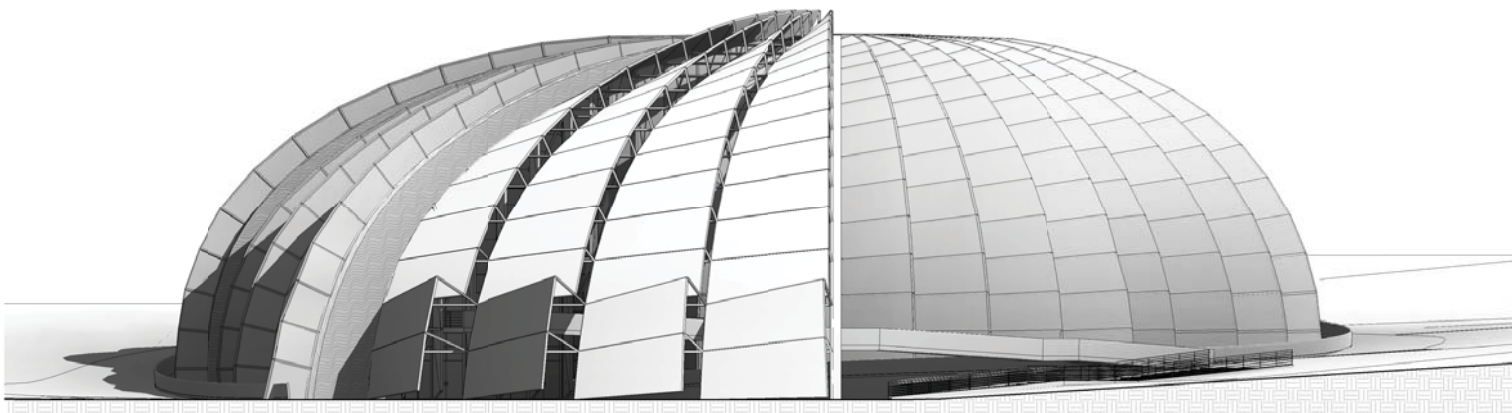
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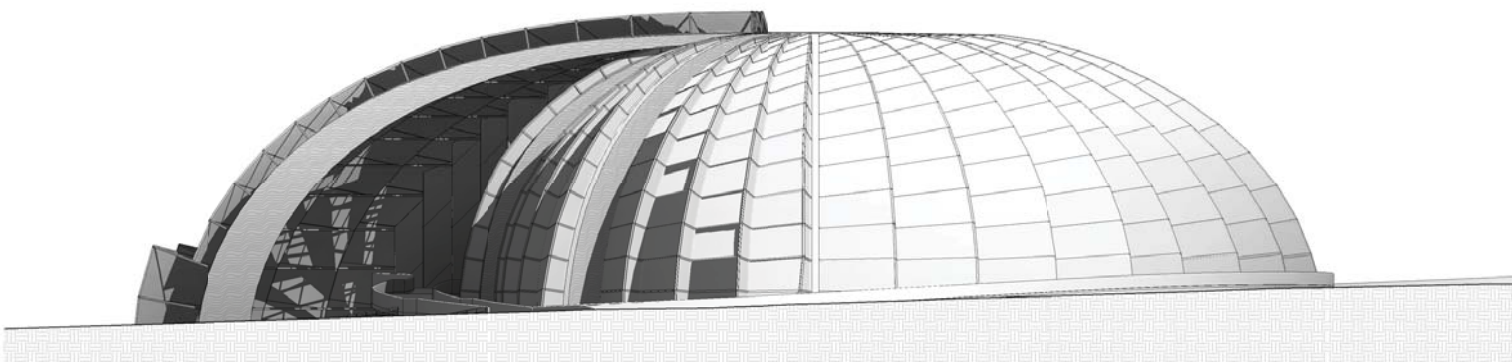
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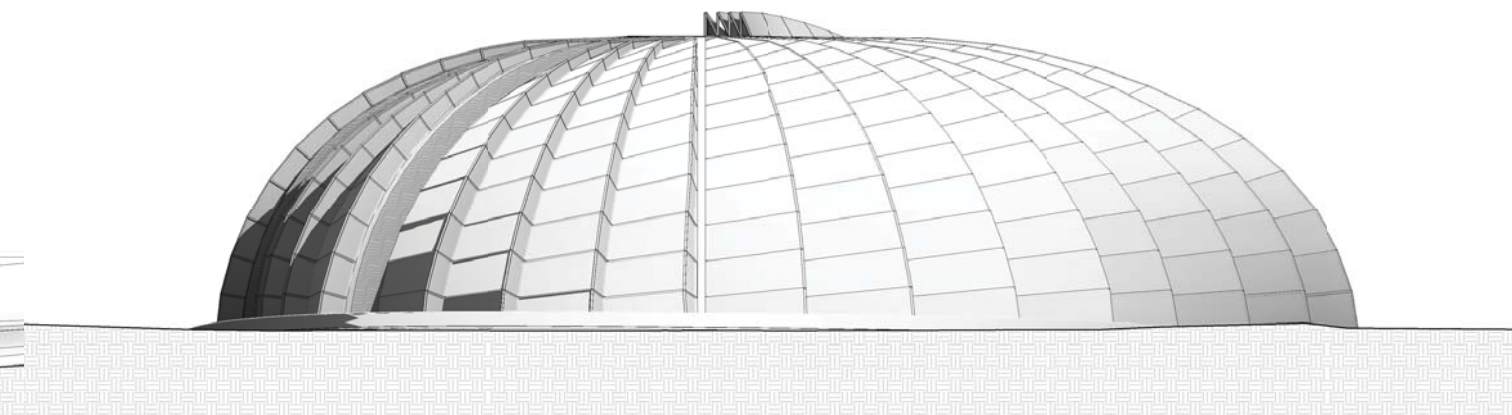
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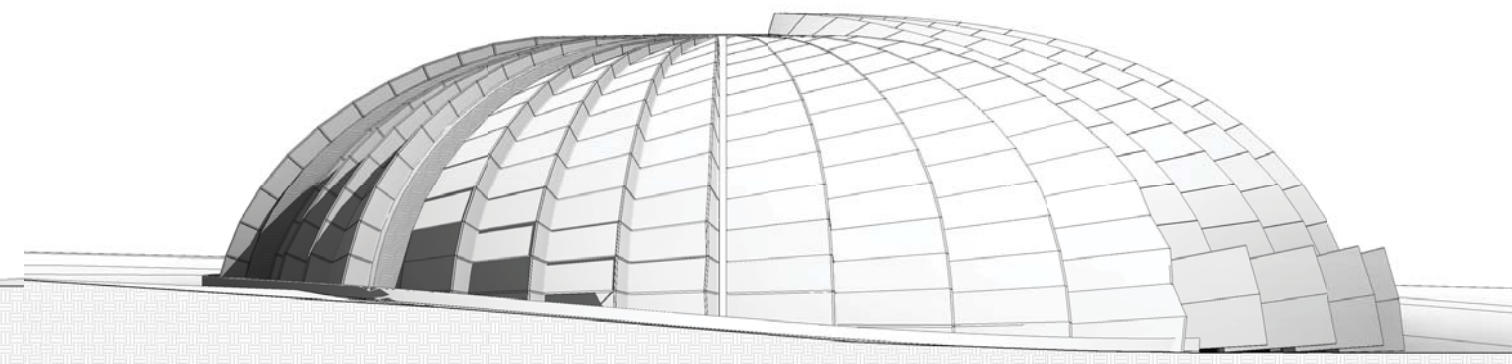
EAST ELEVATION



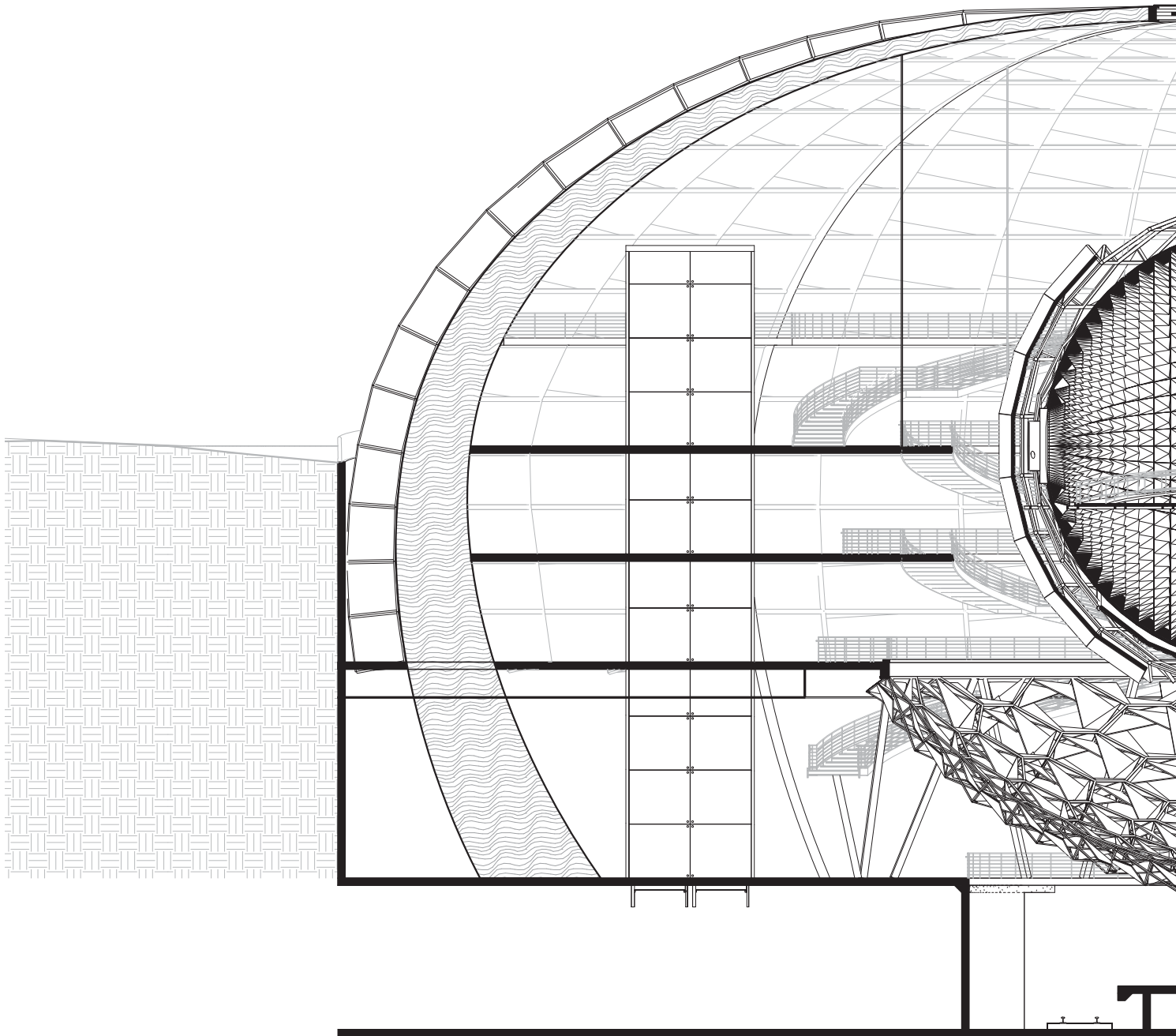
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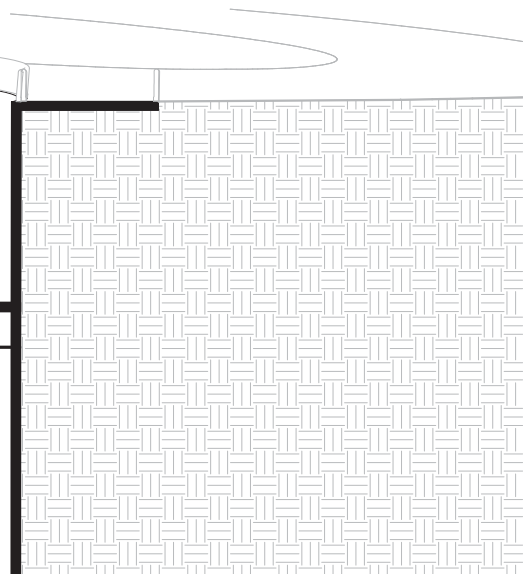
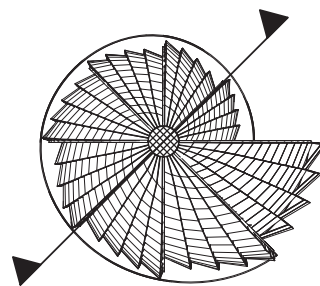
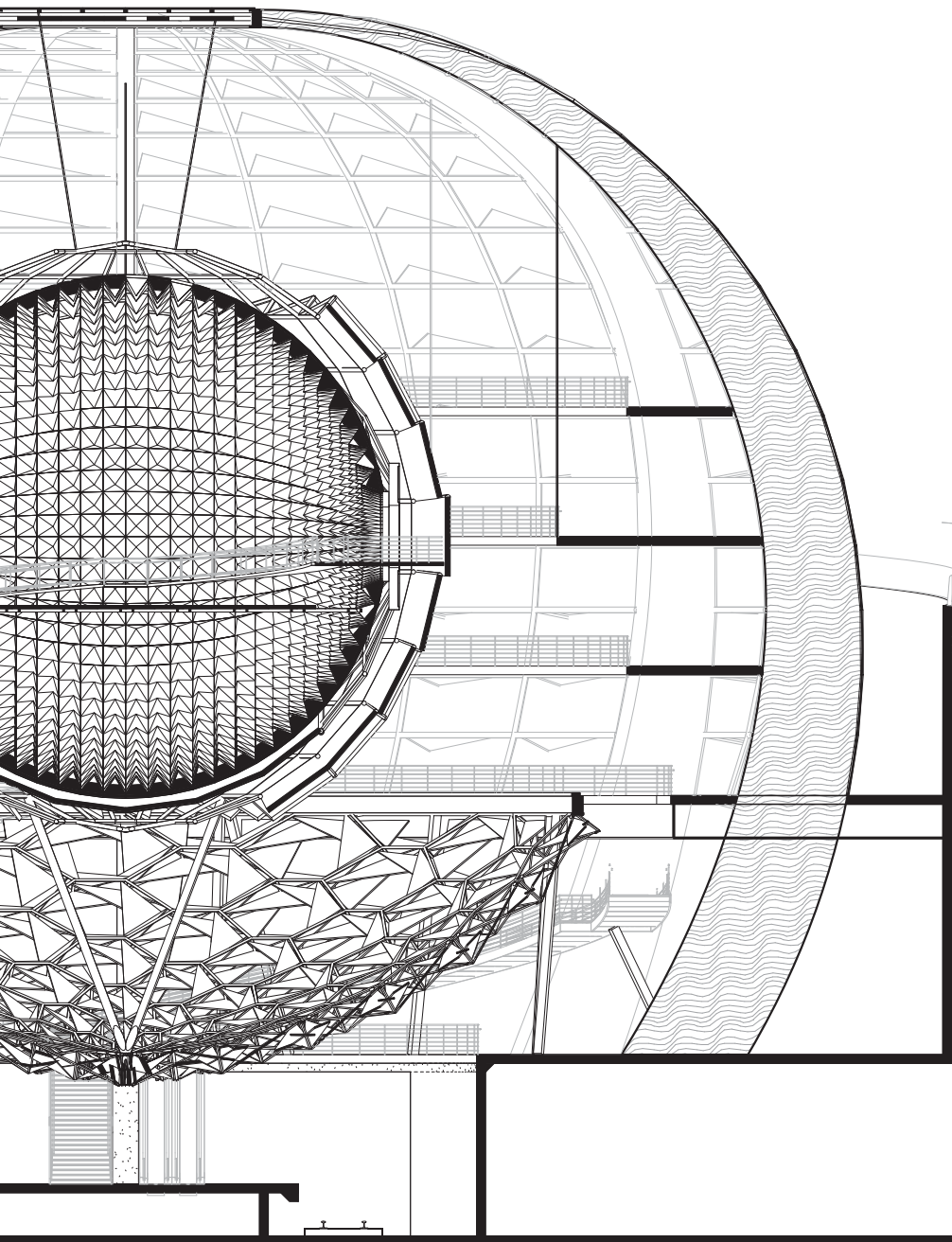


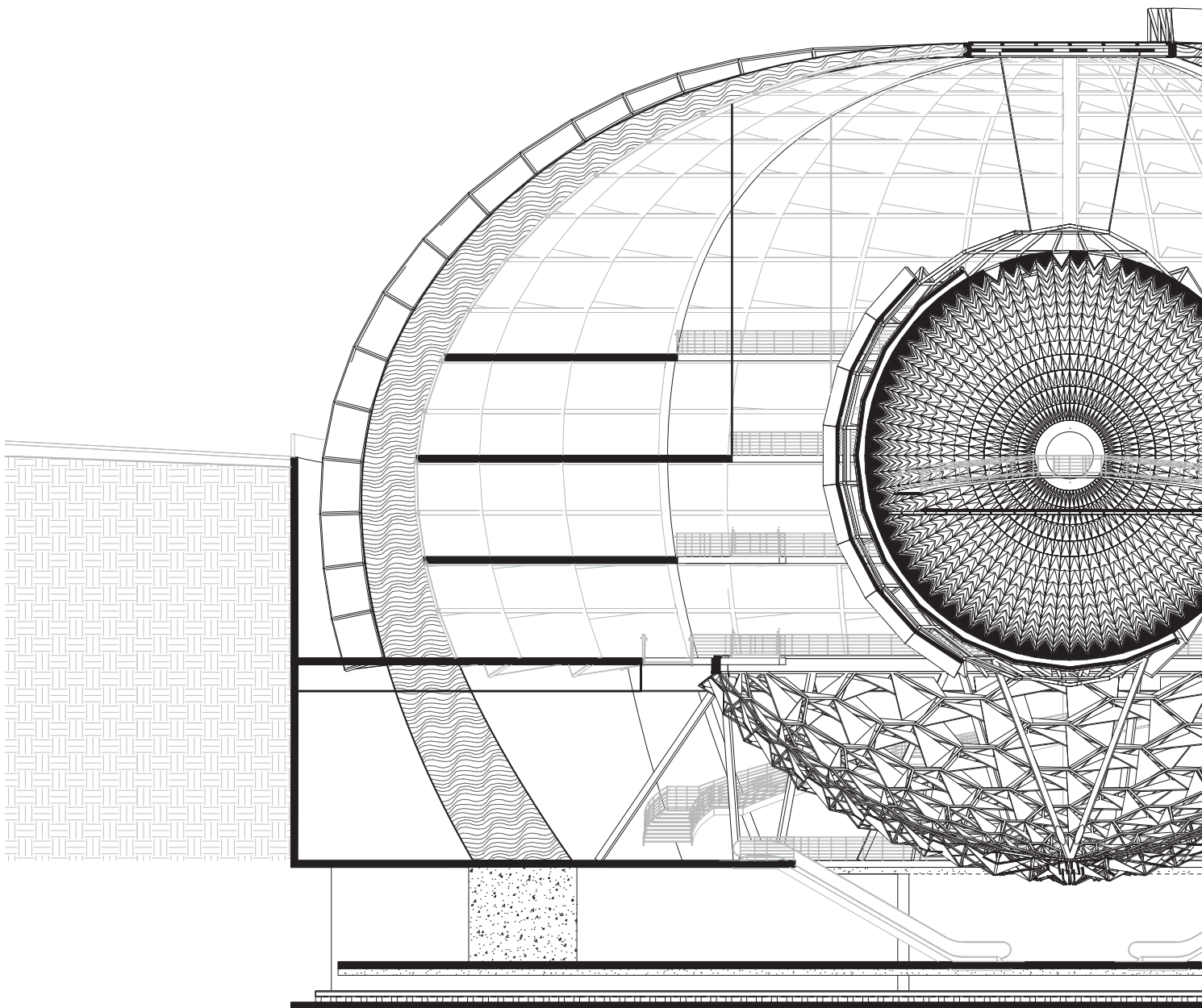
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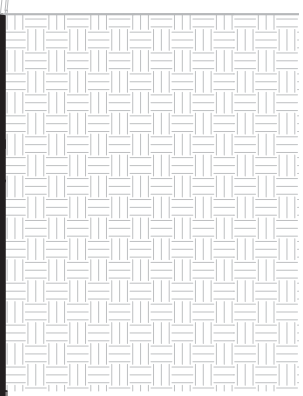
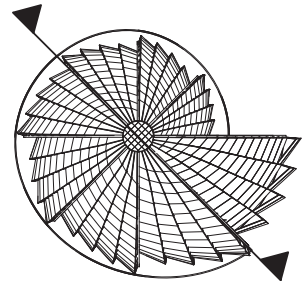
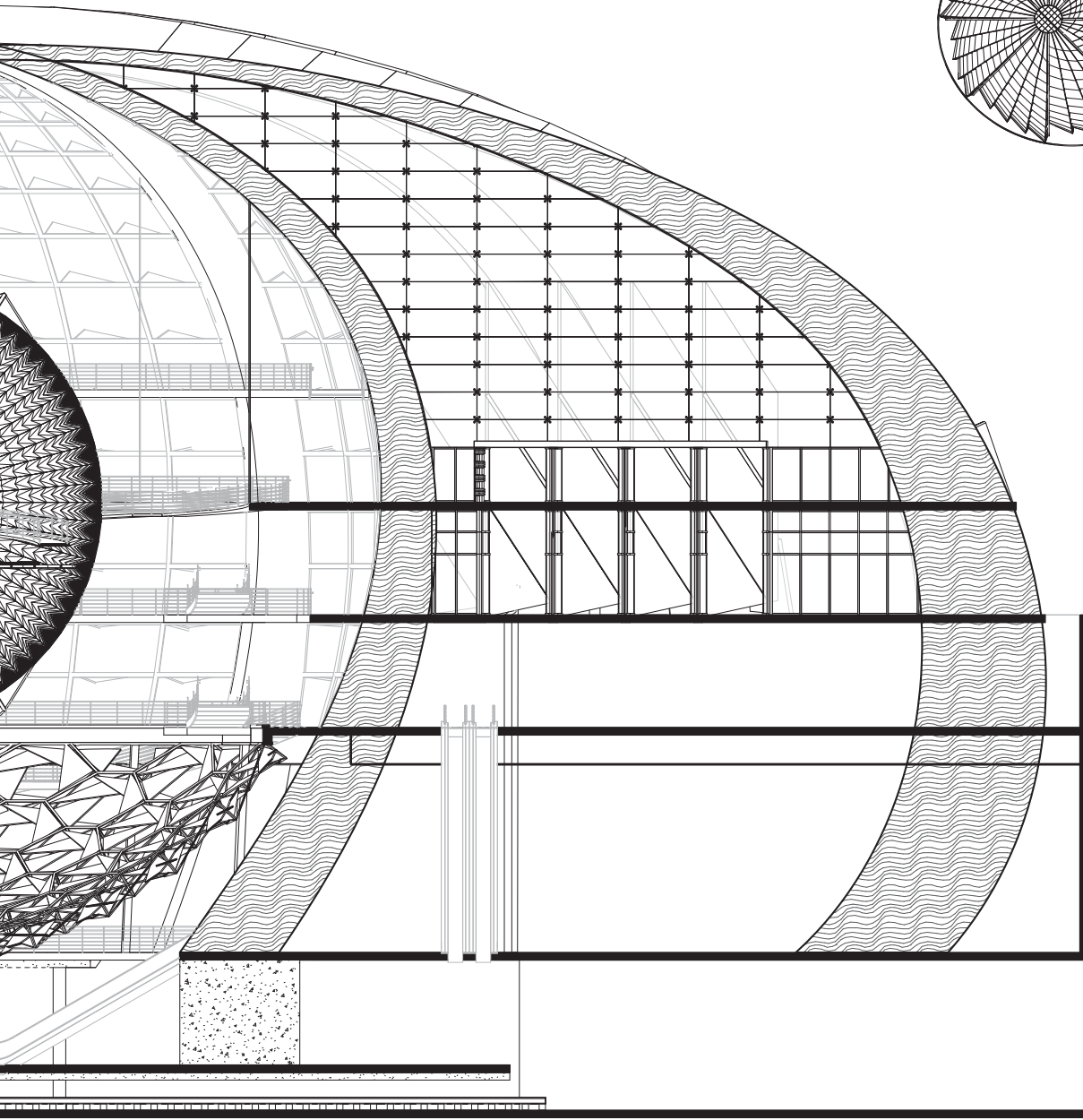


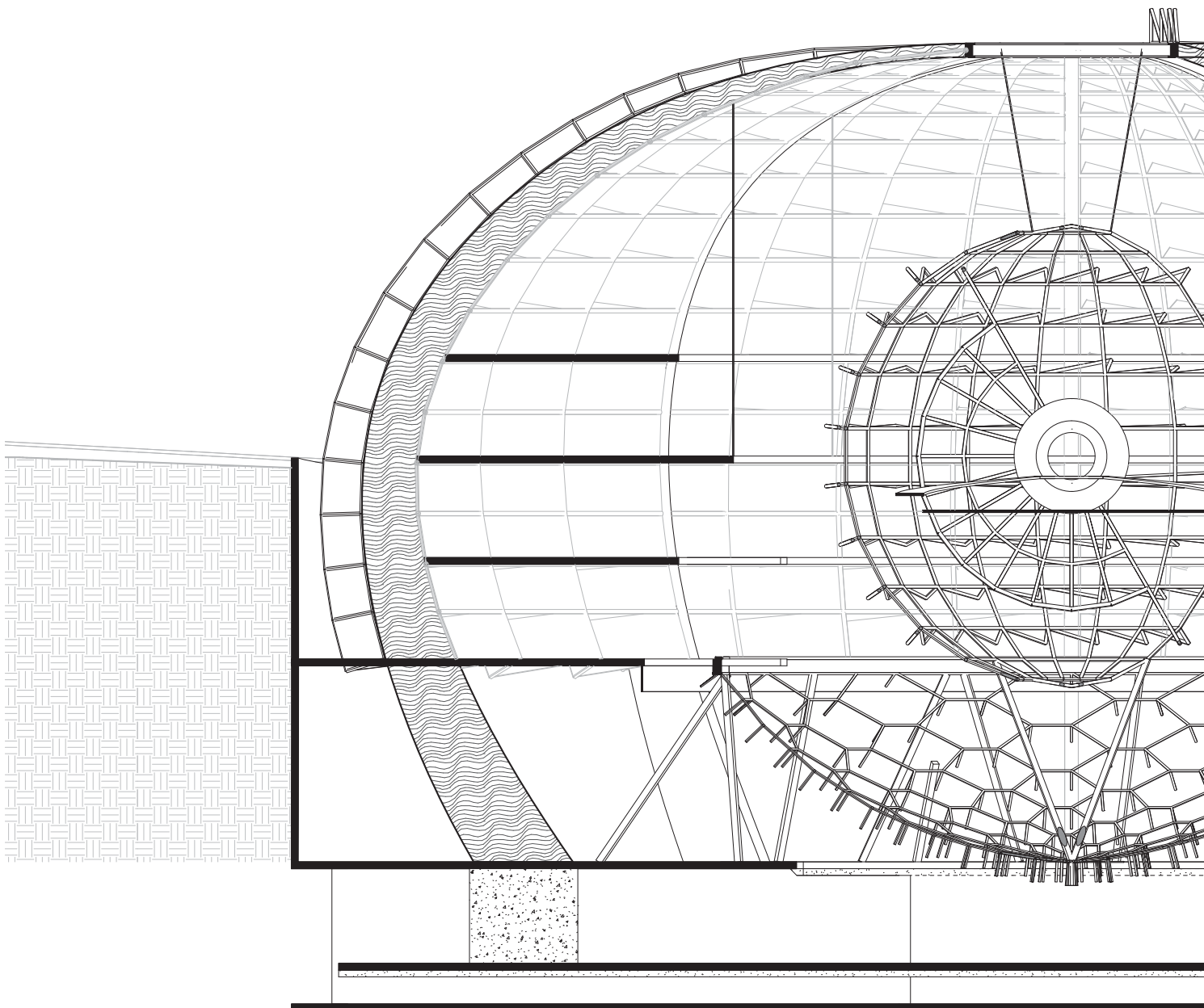
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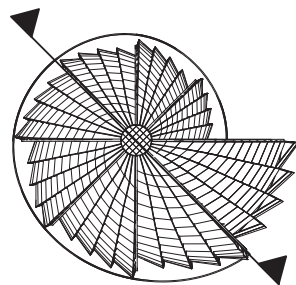
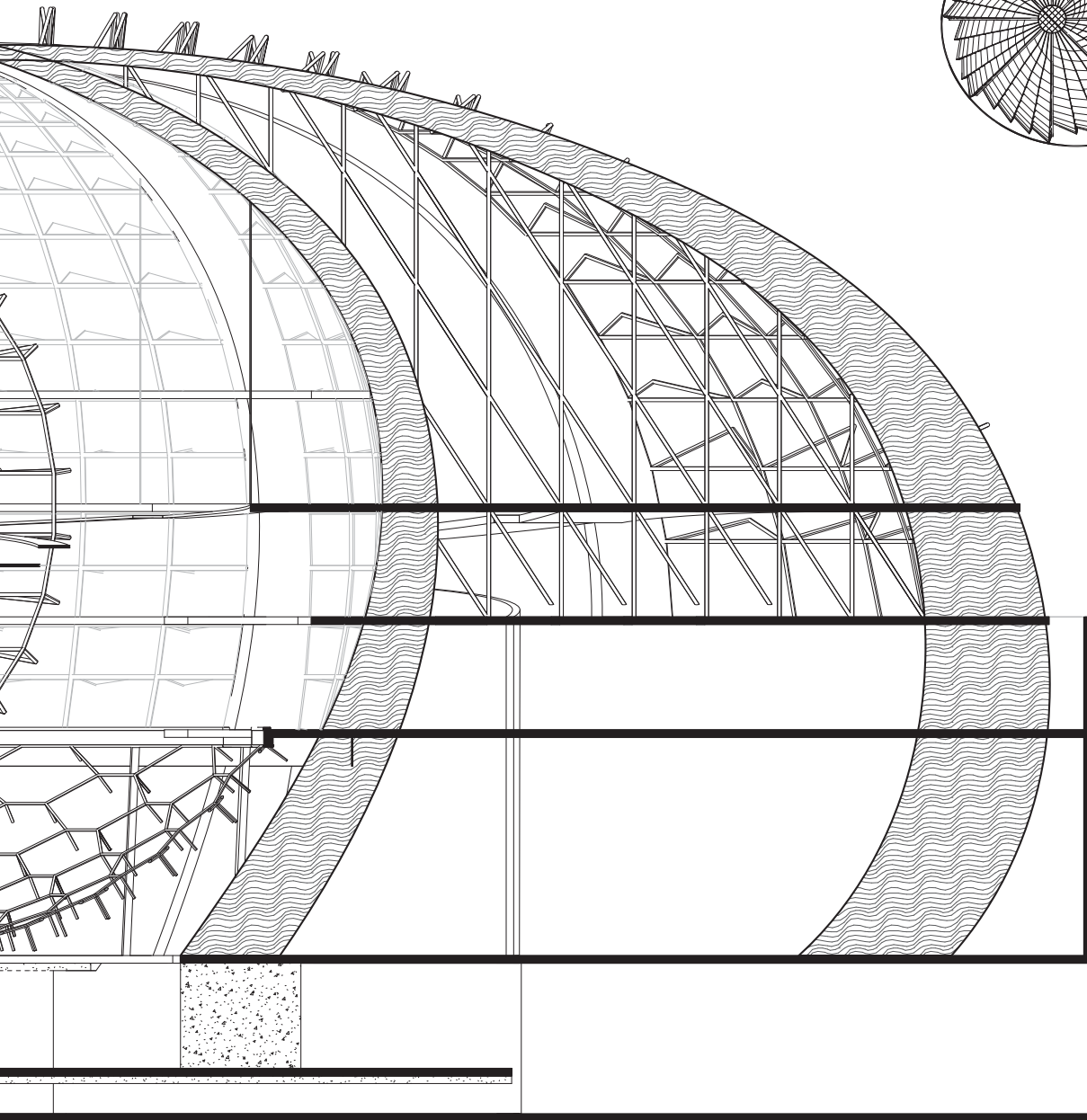


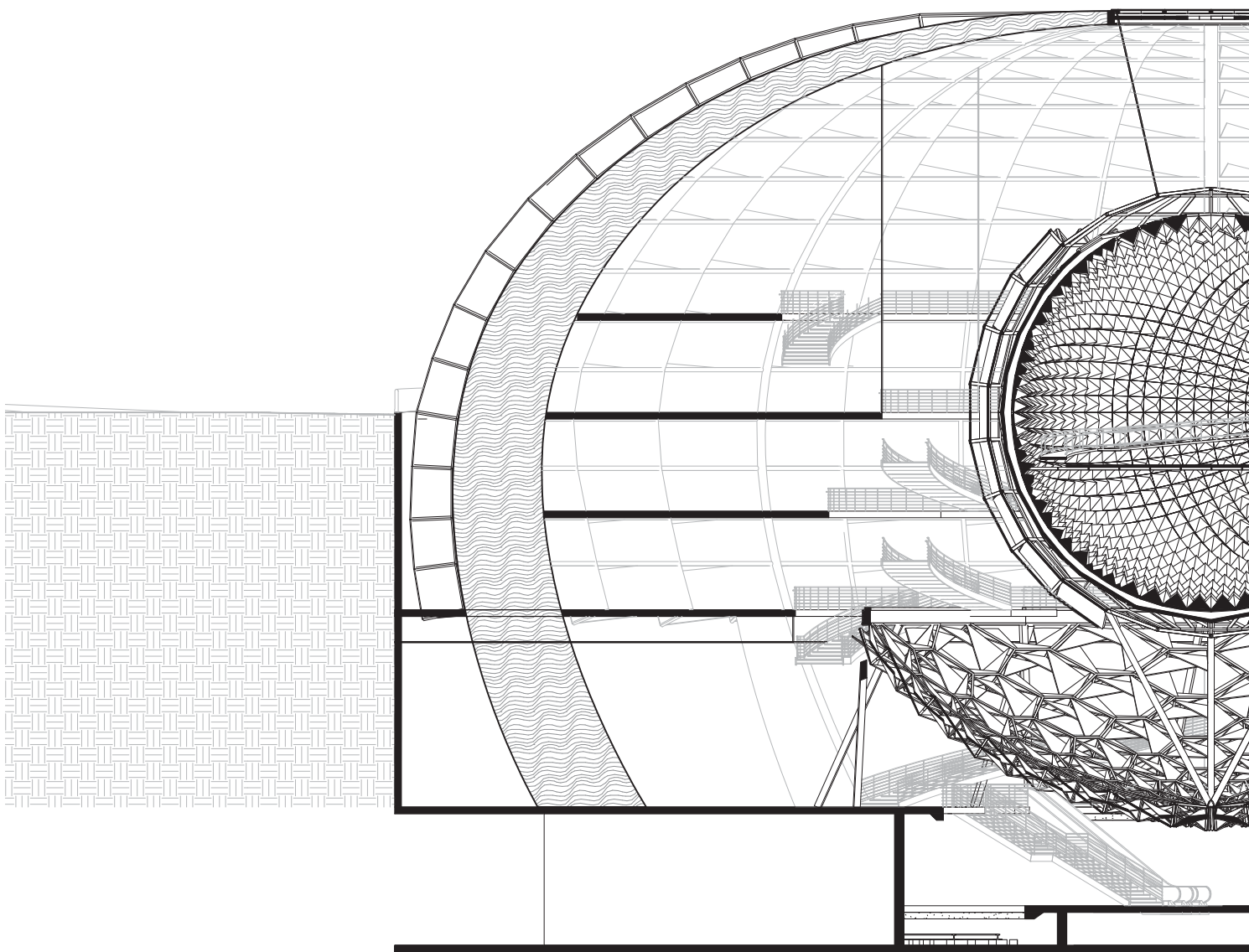


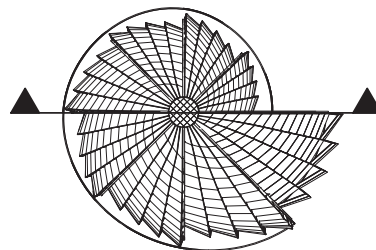
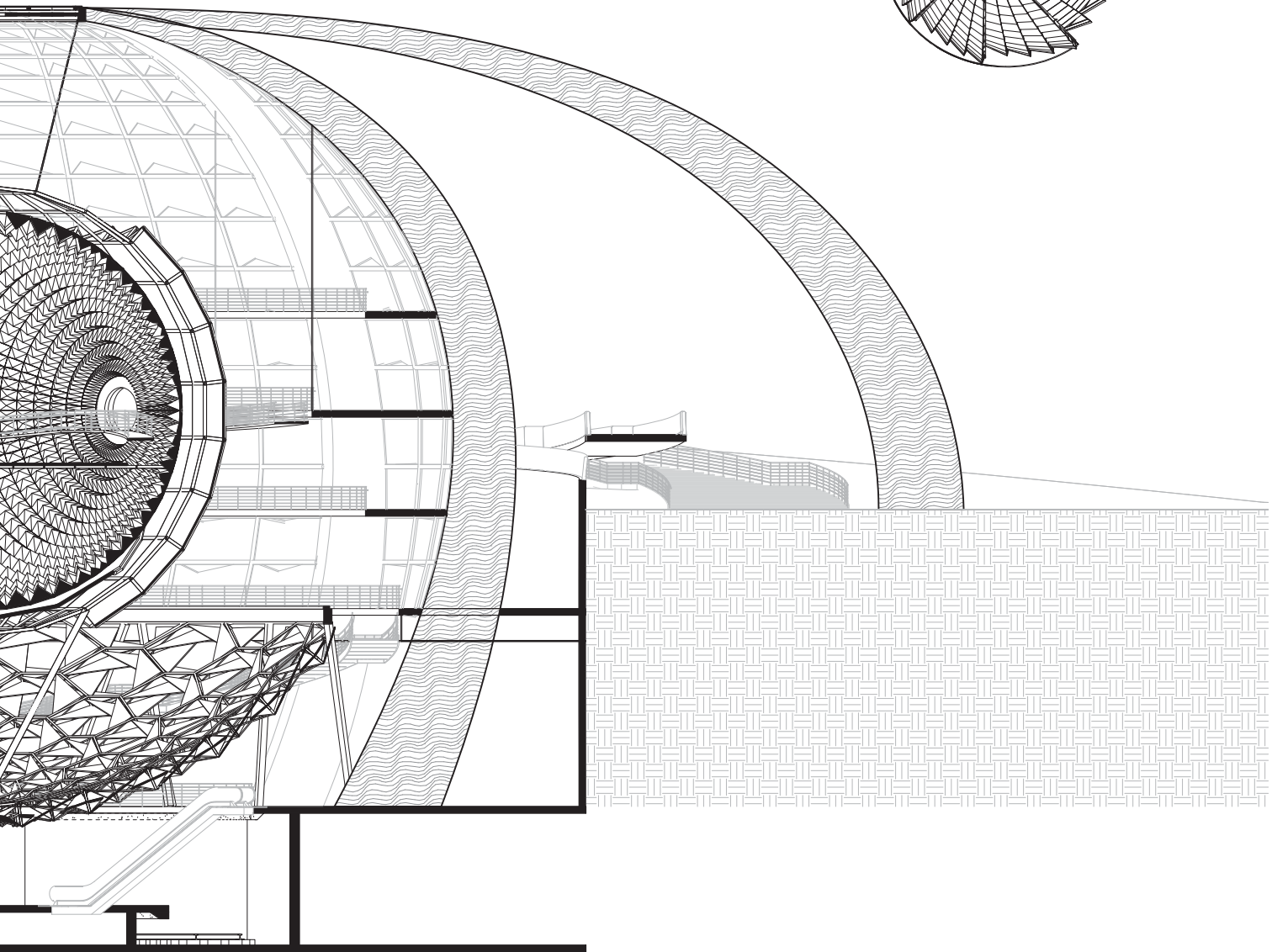


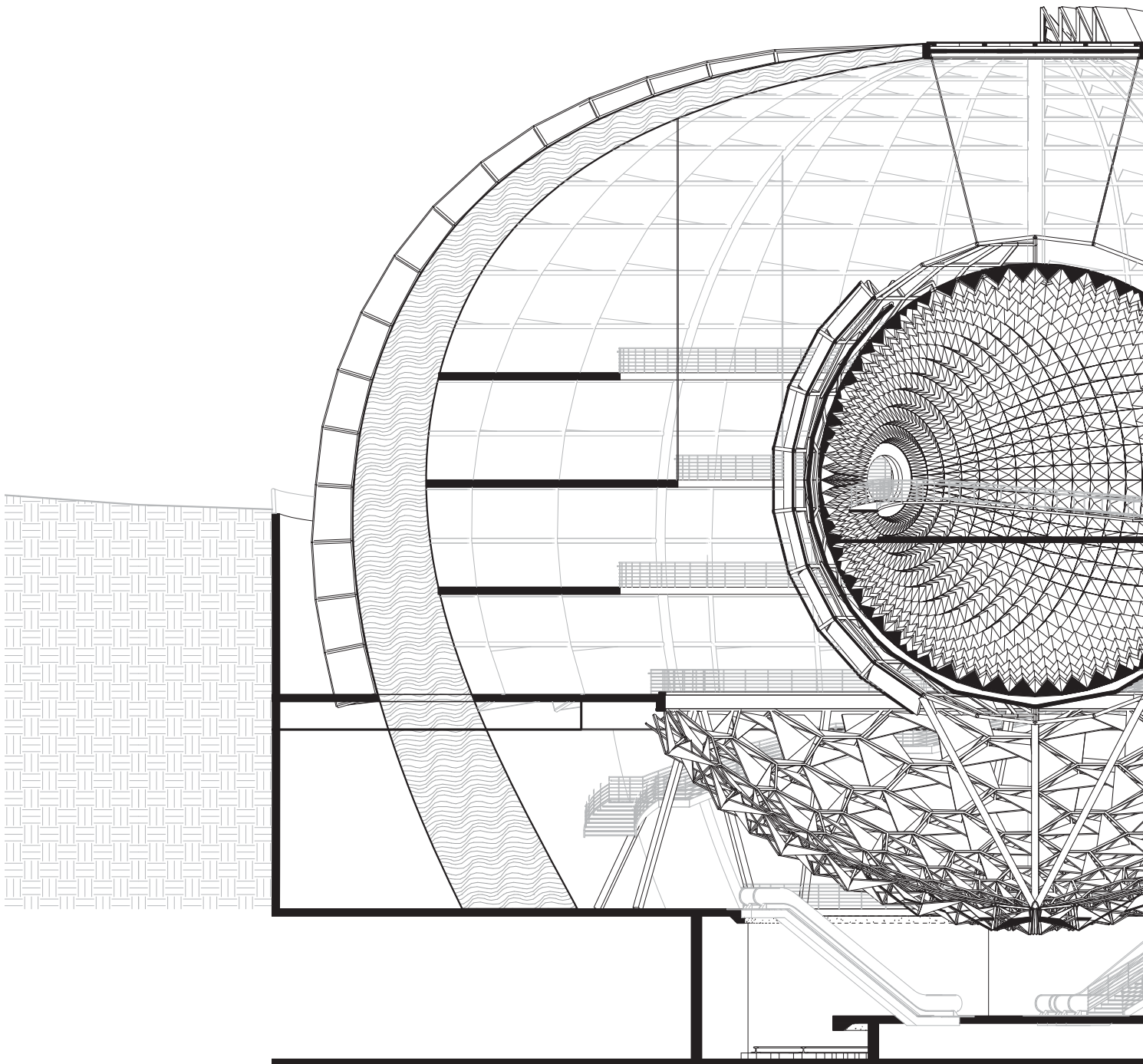


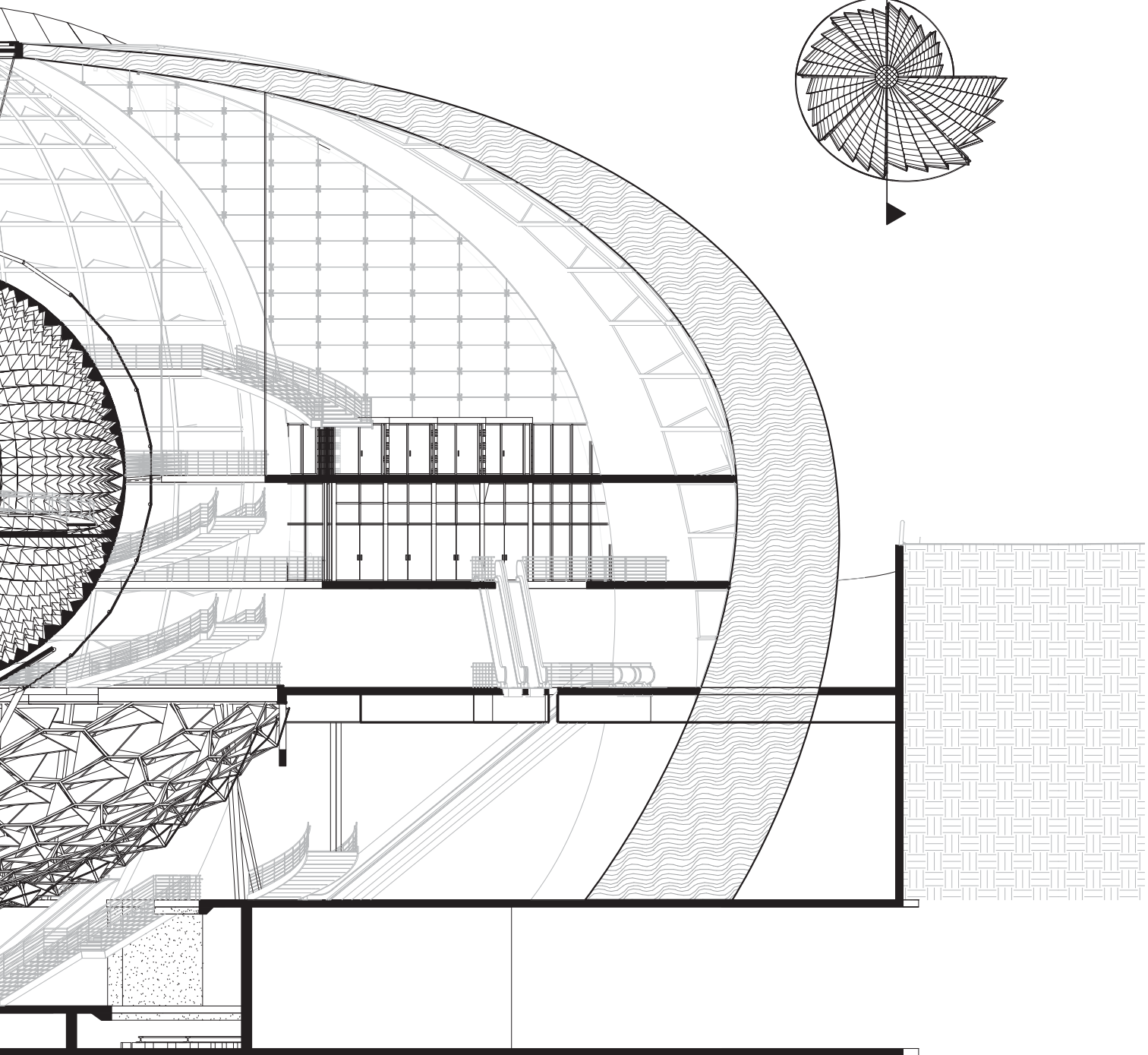


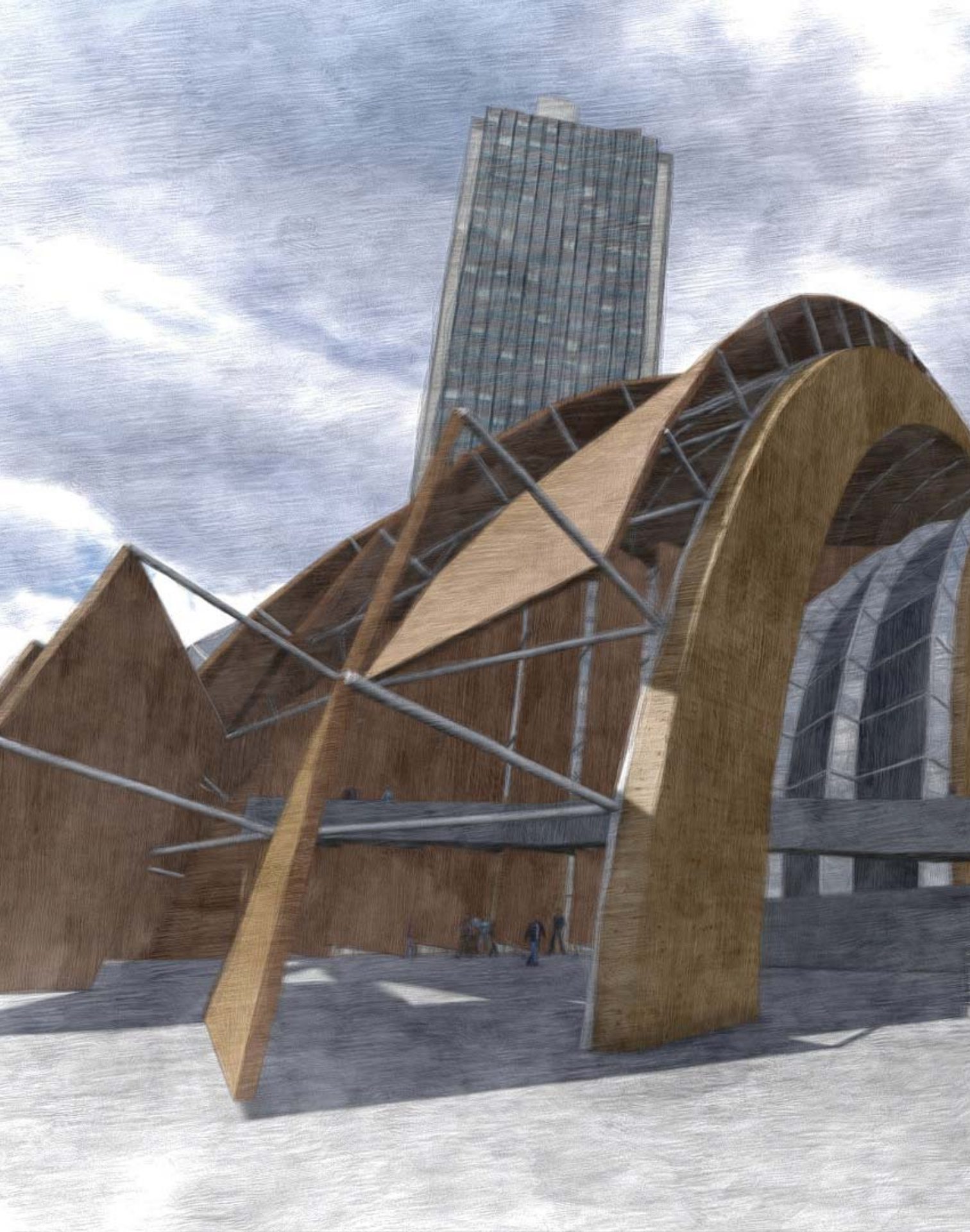


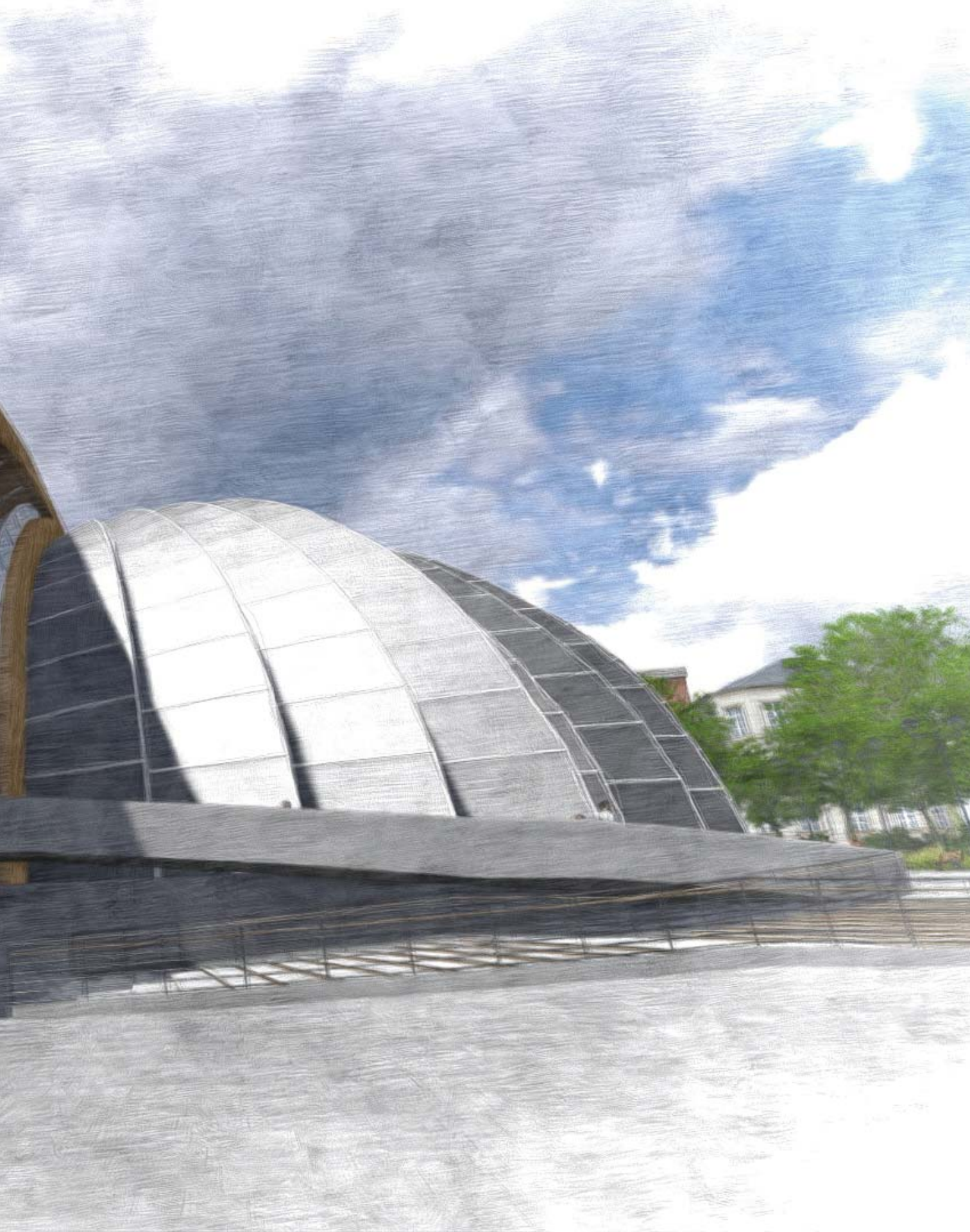


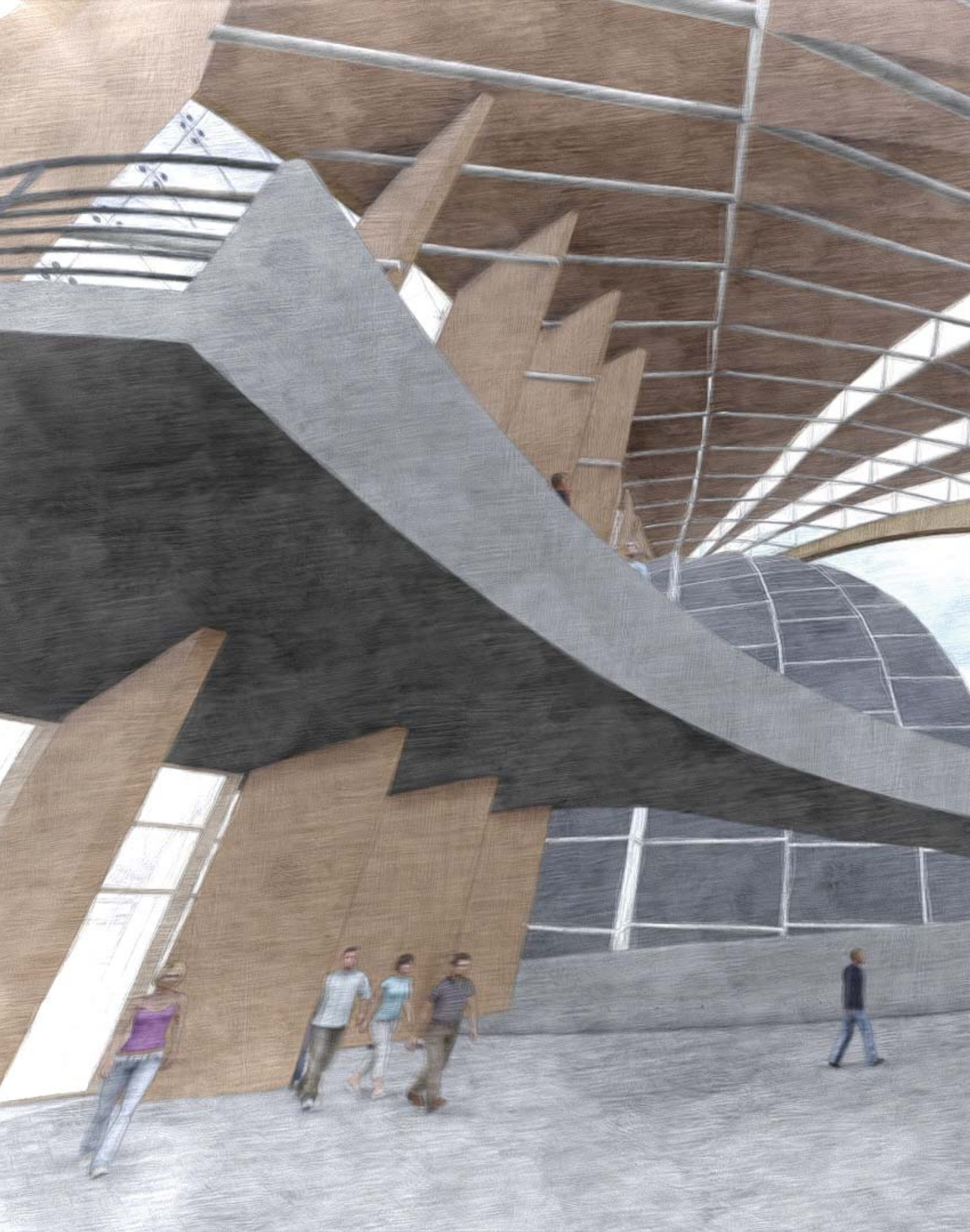


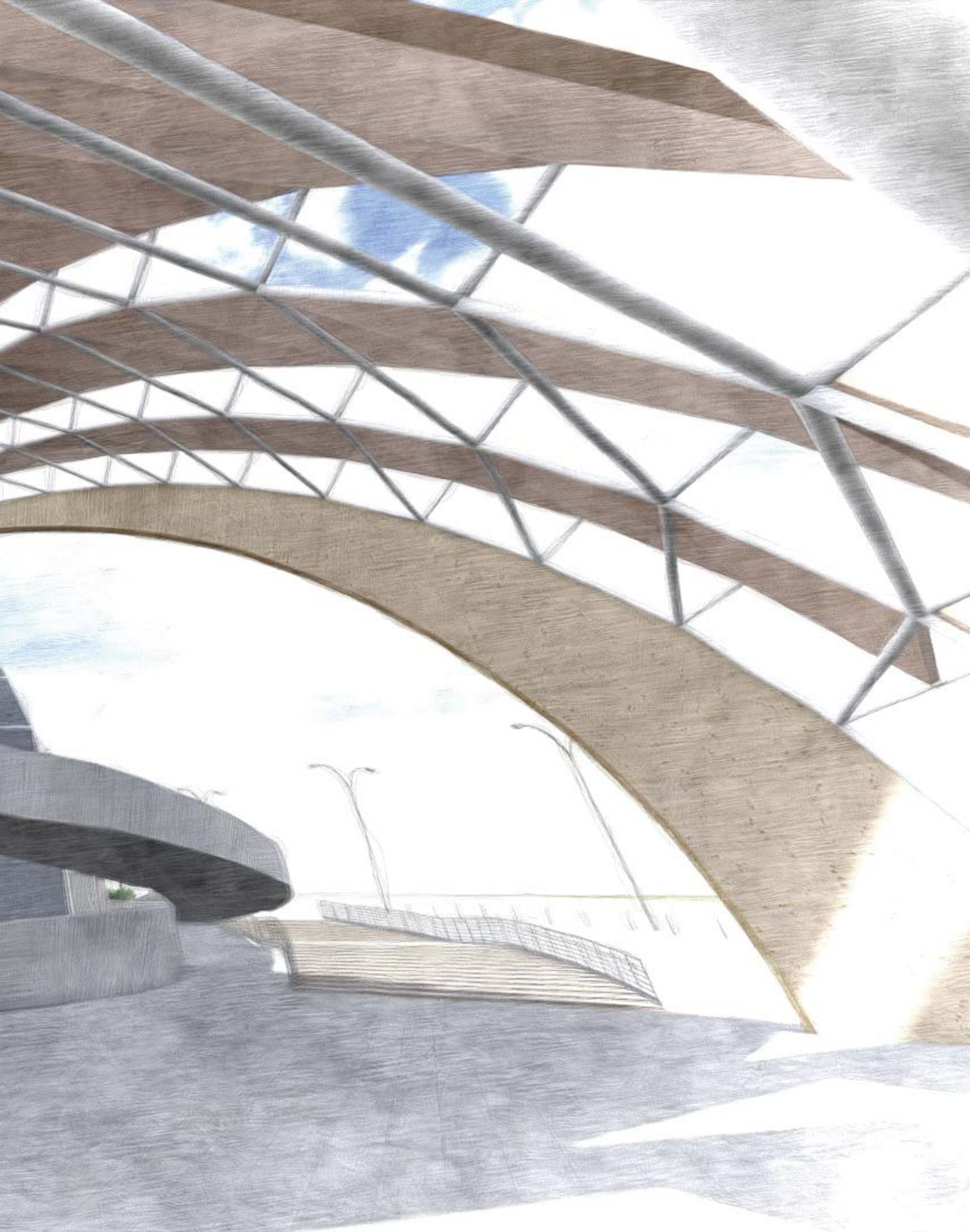


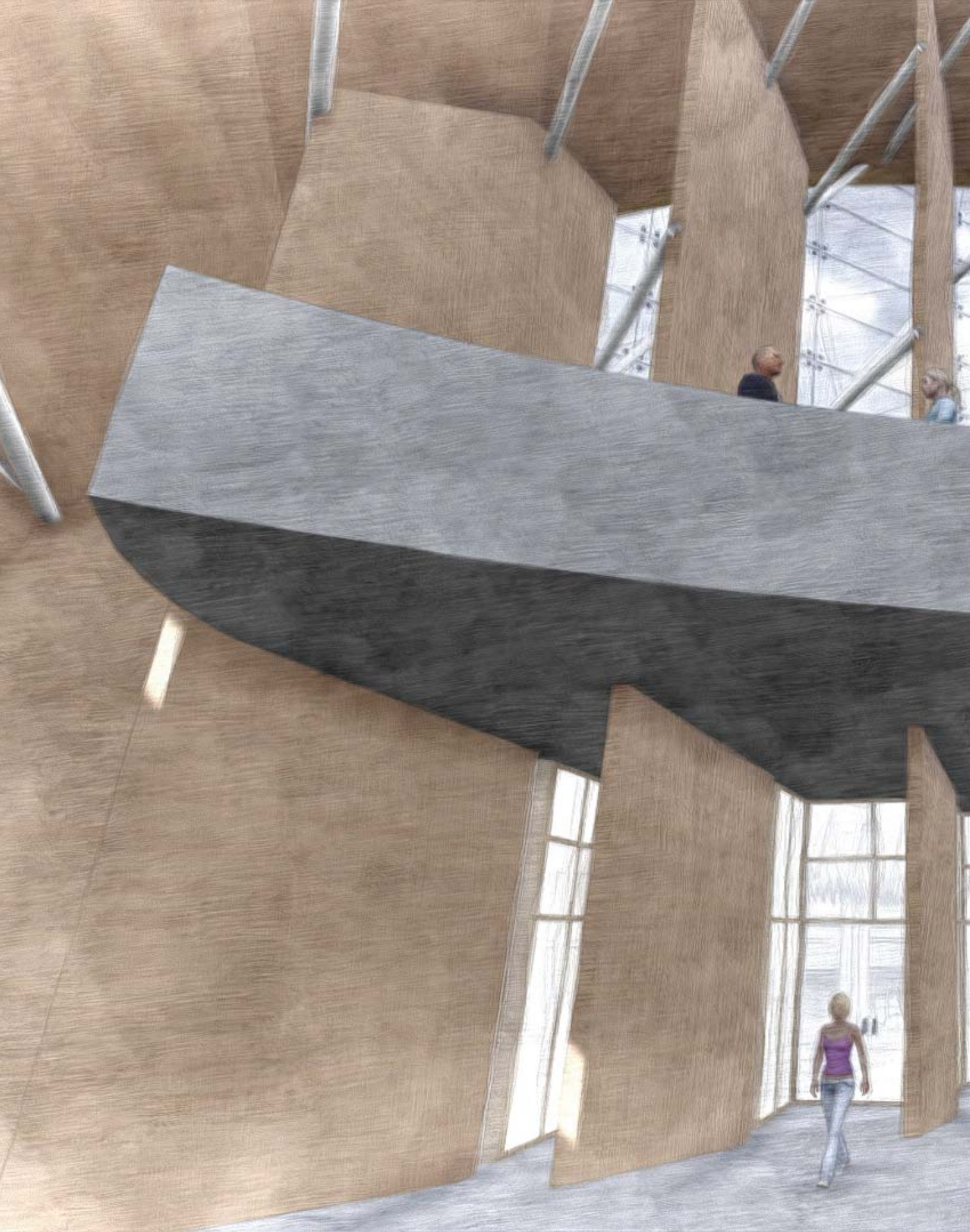


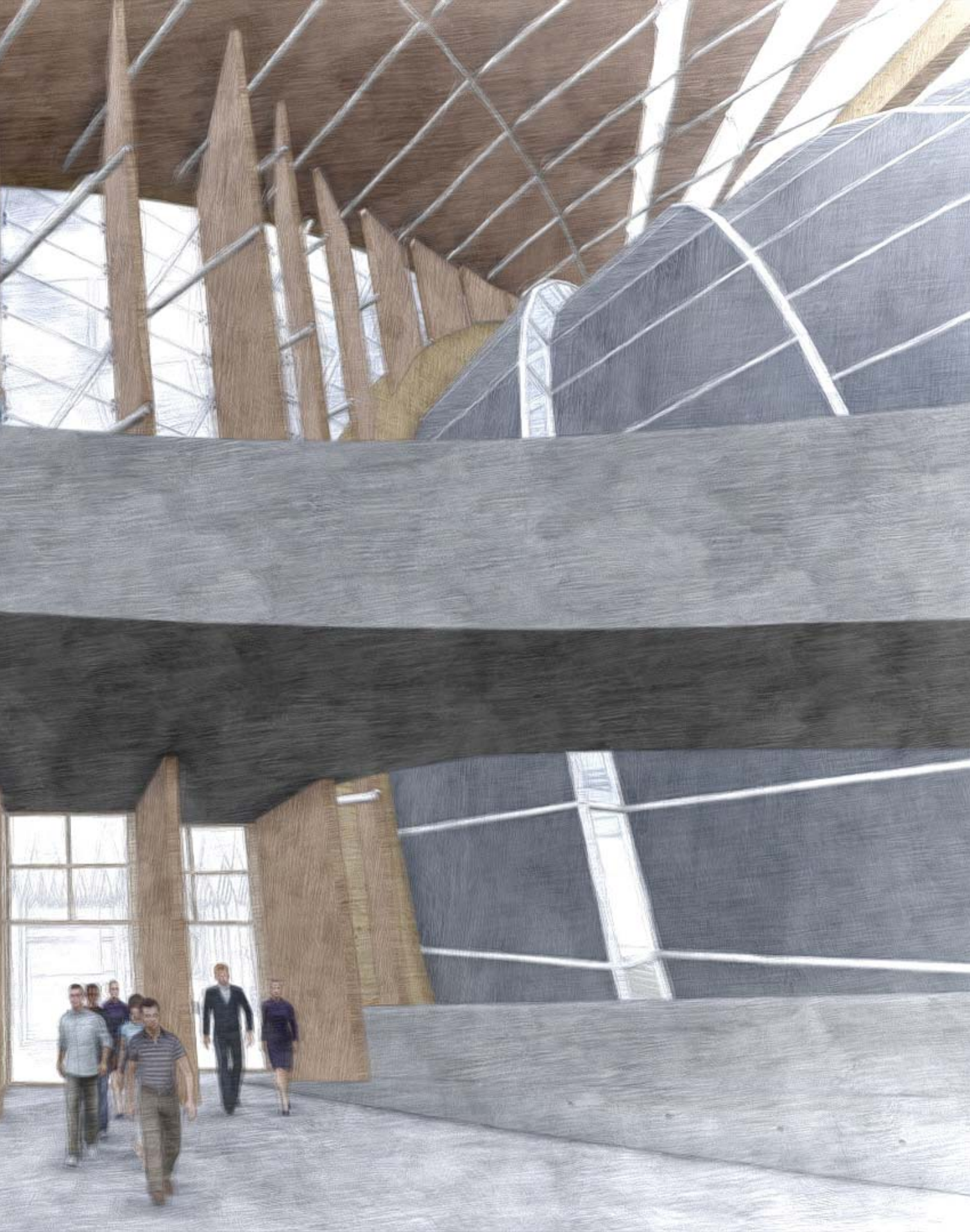


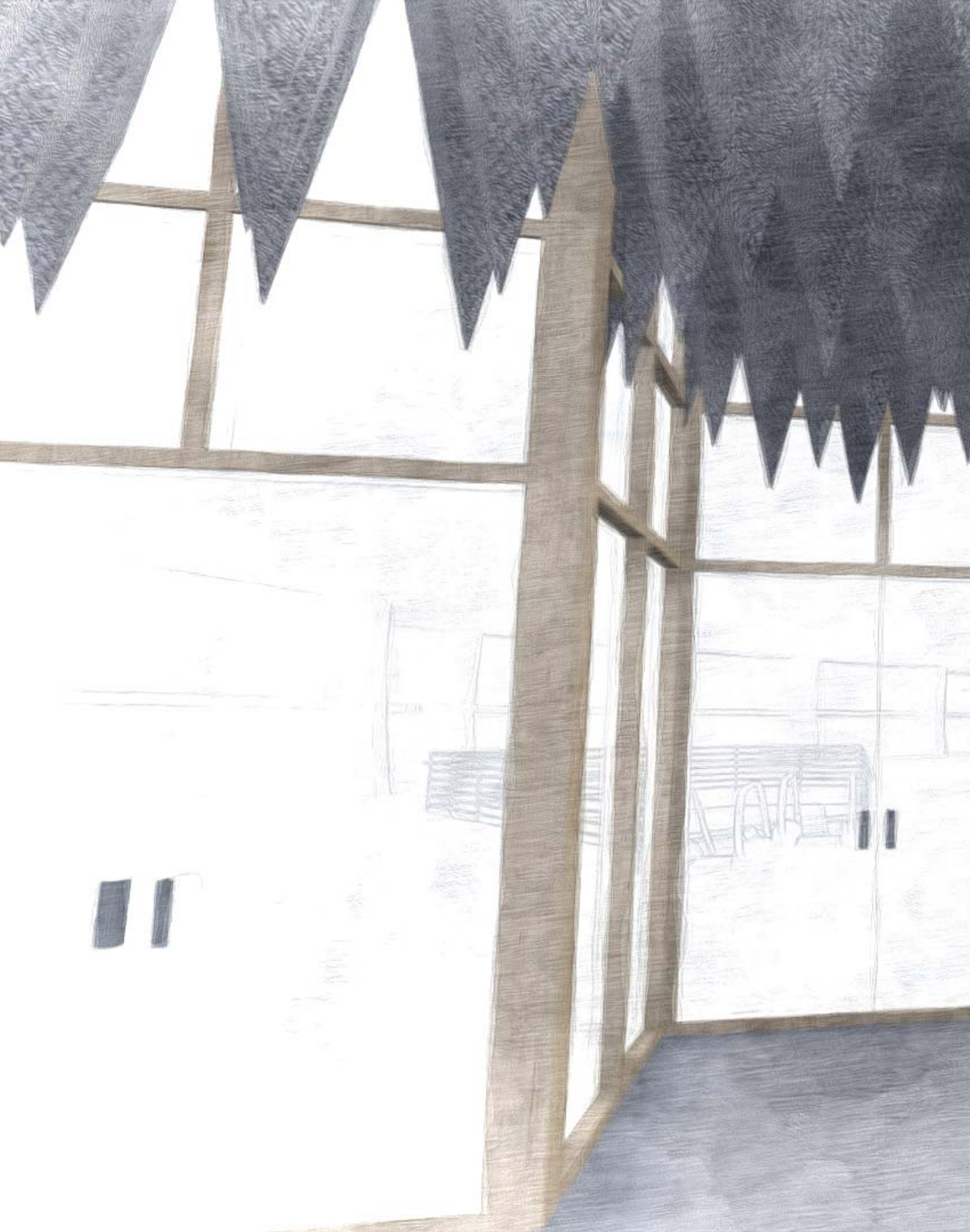


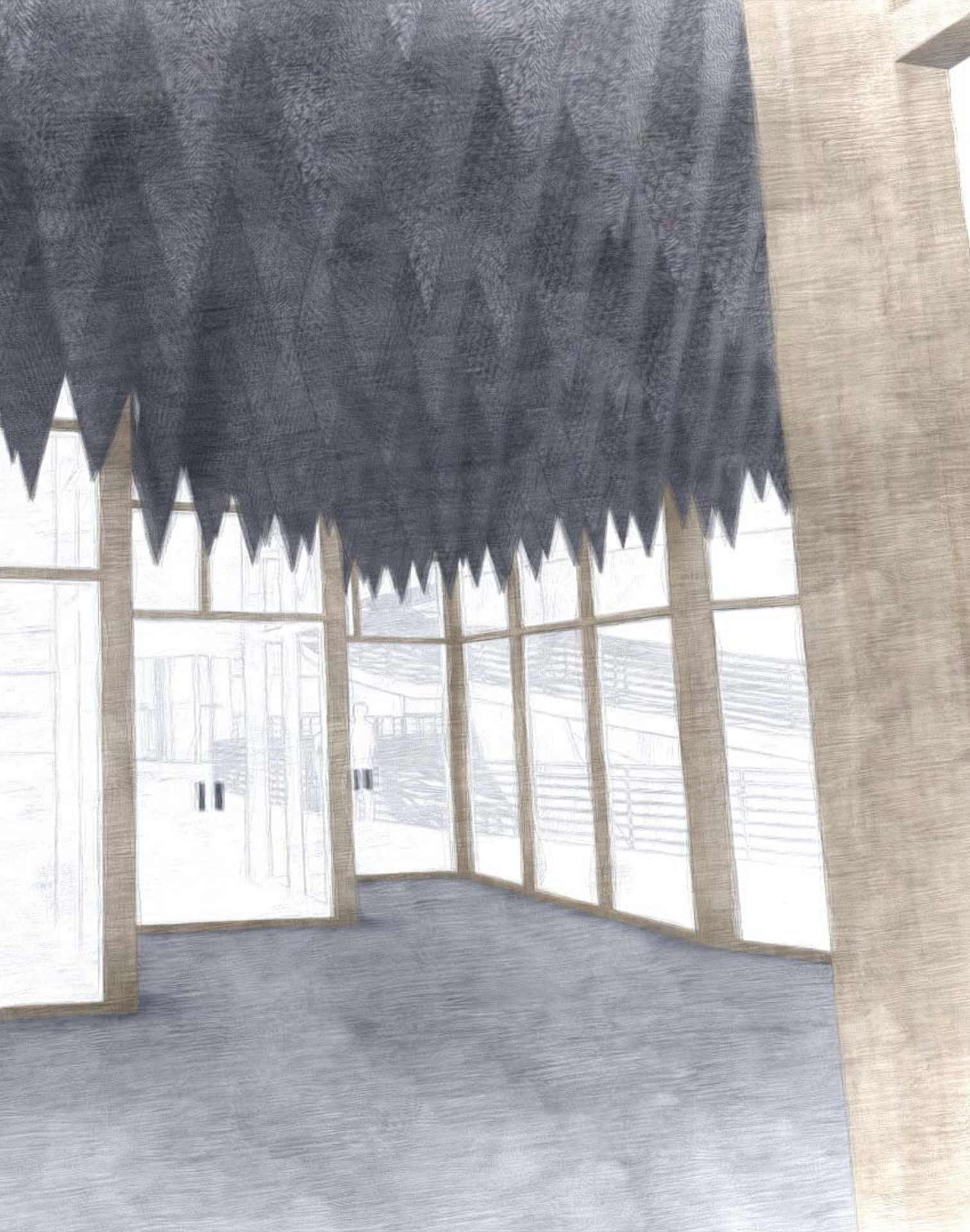


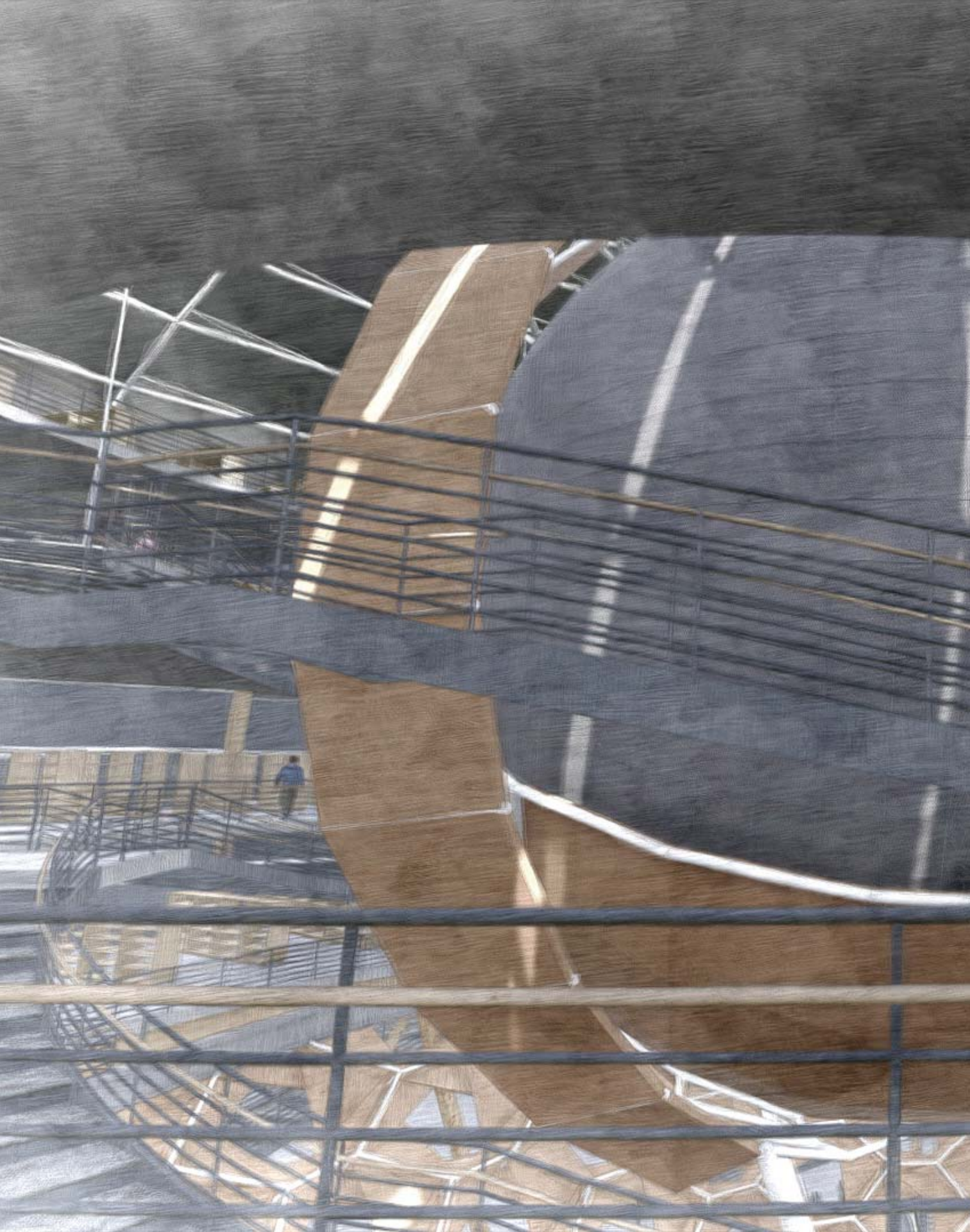


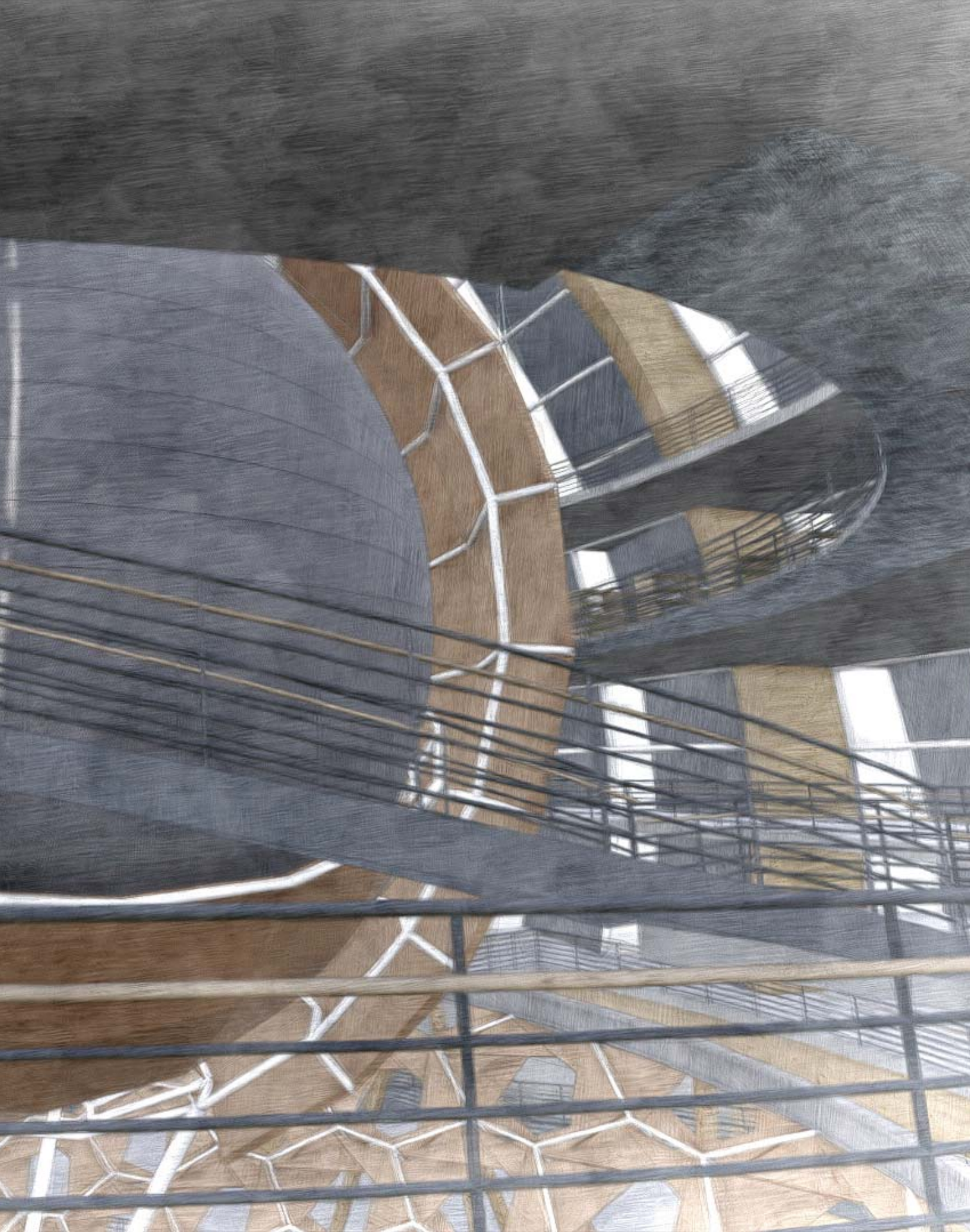


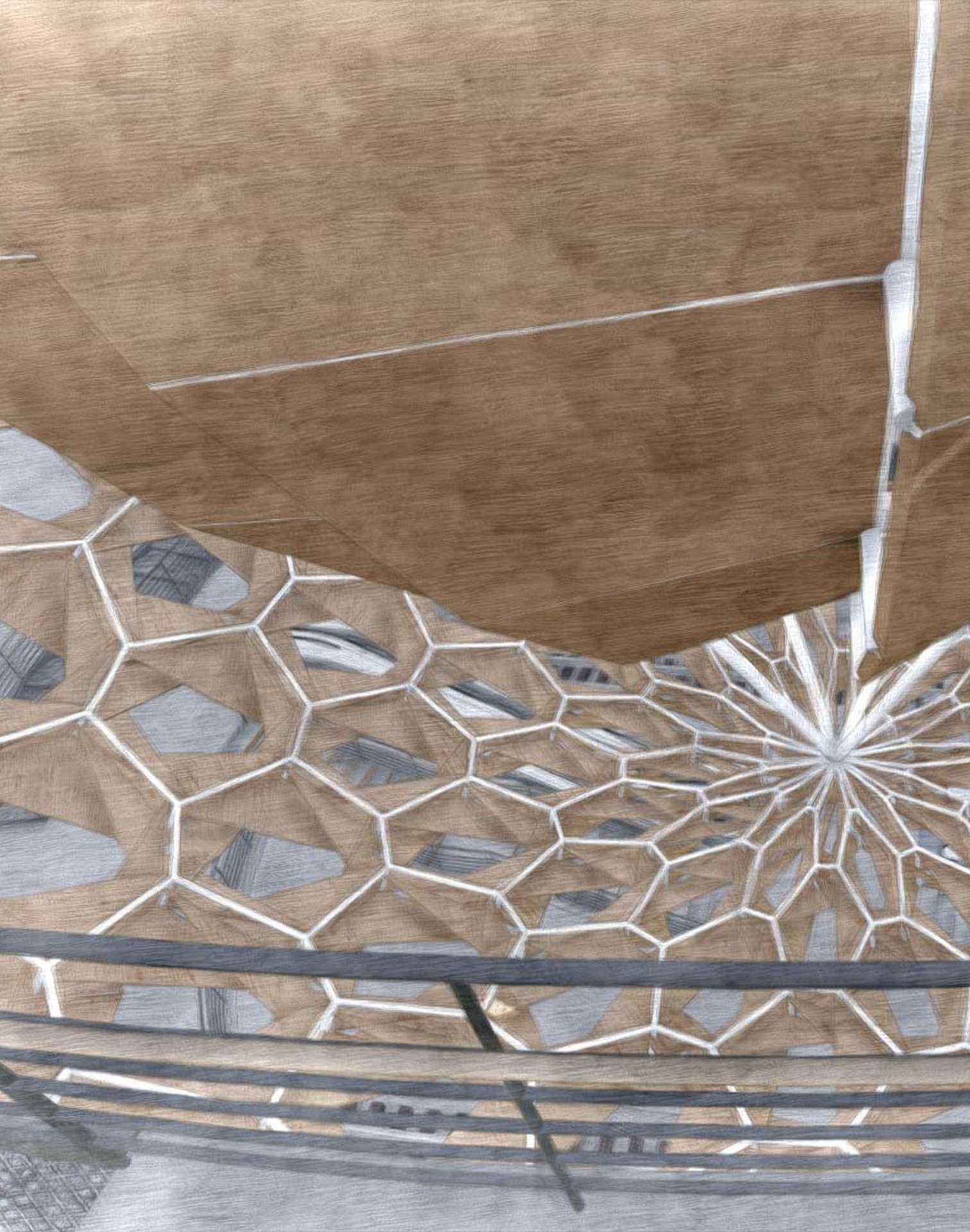


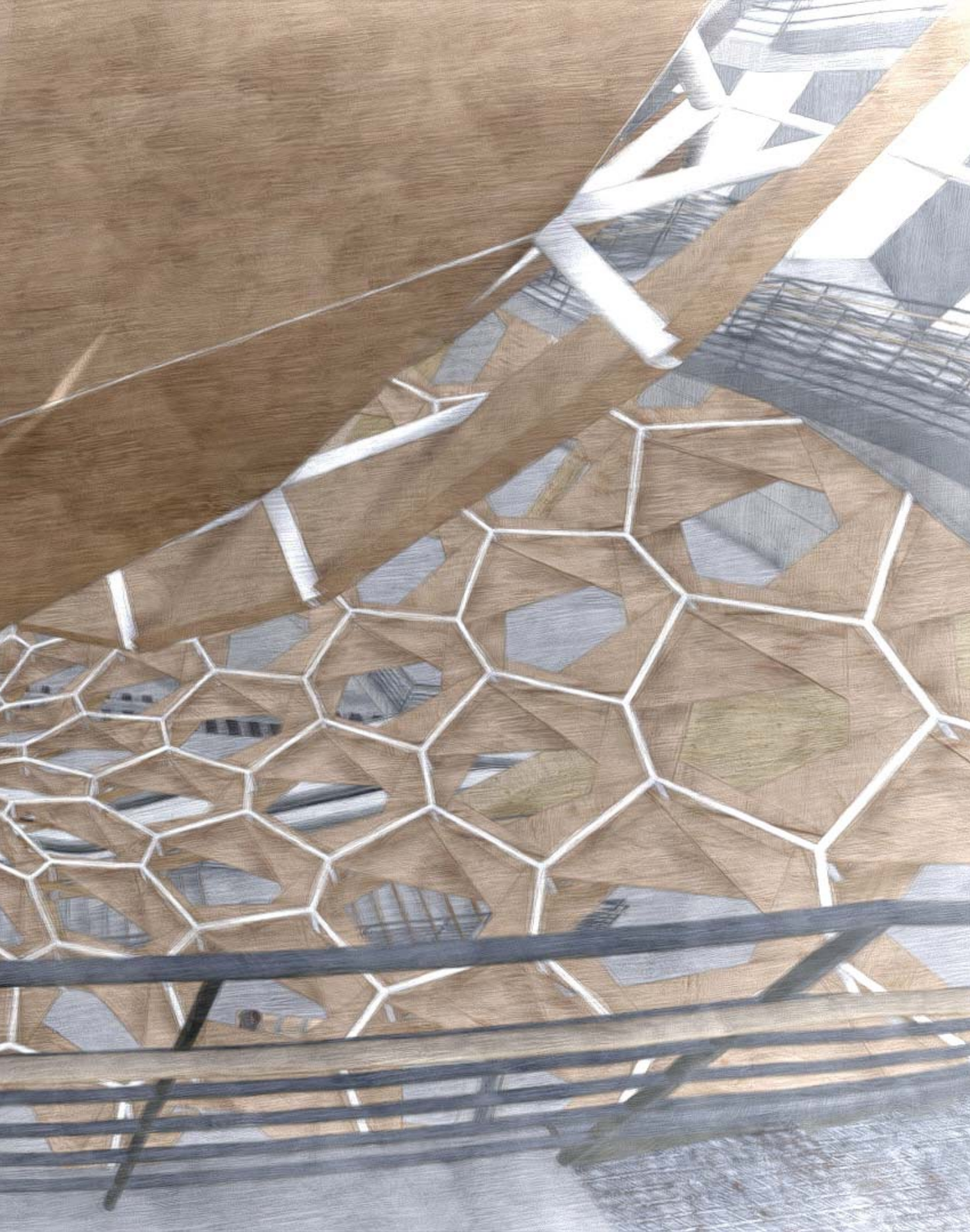


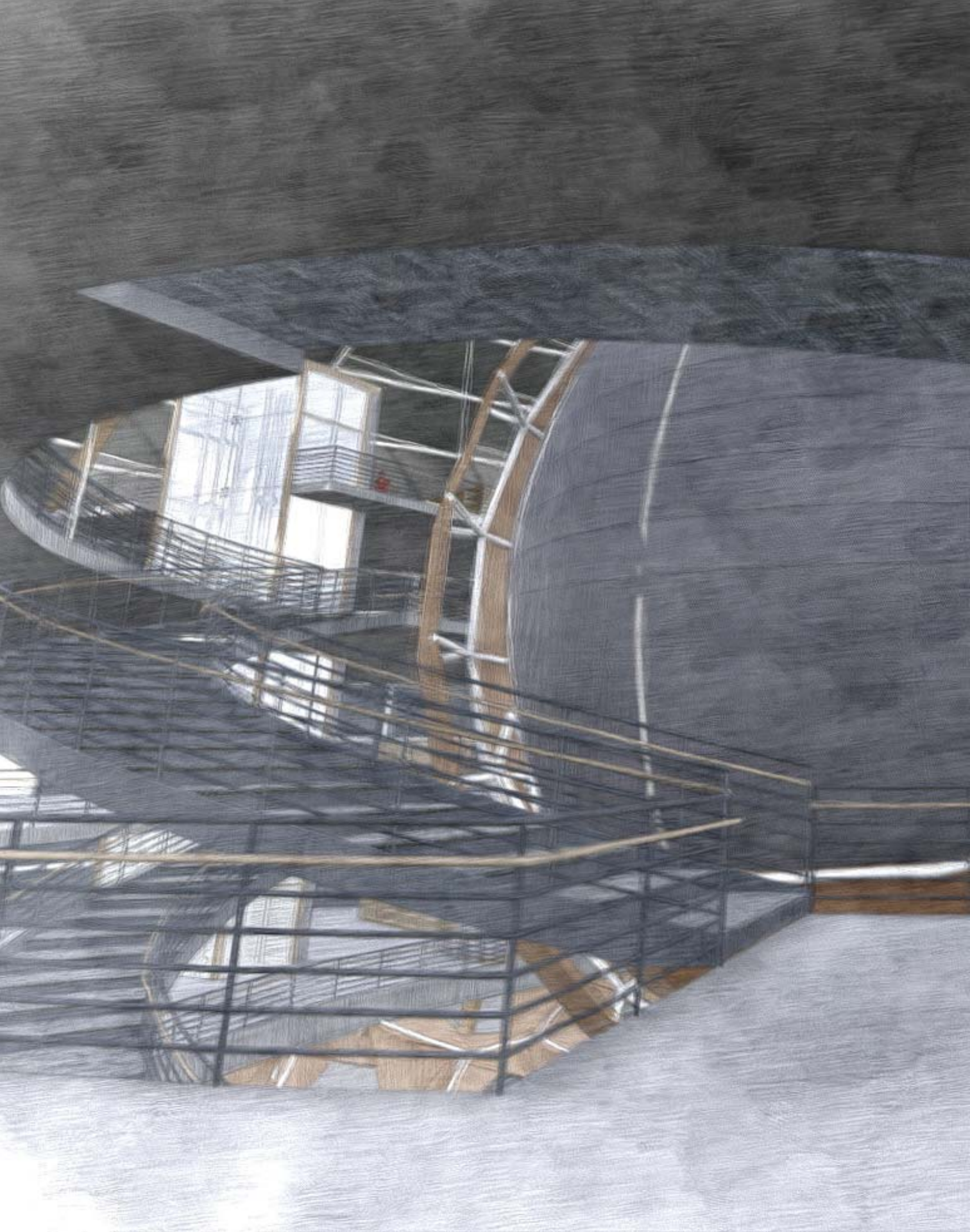


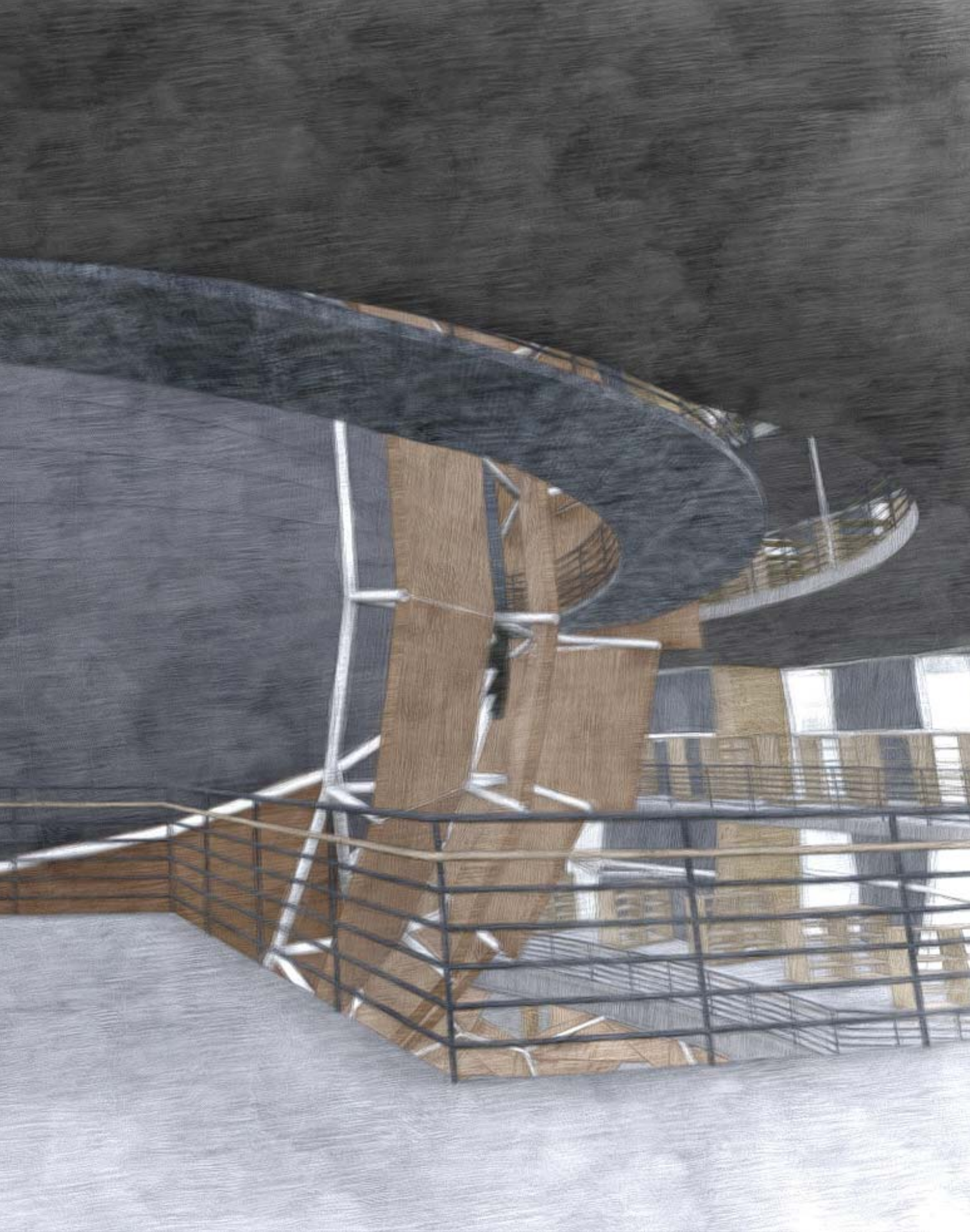


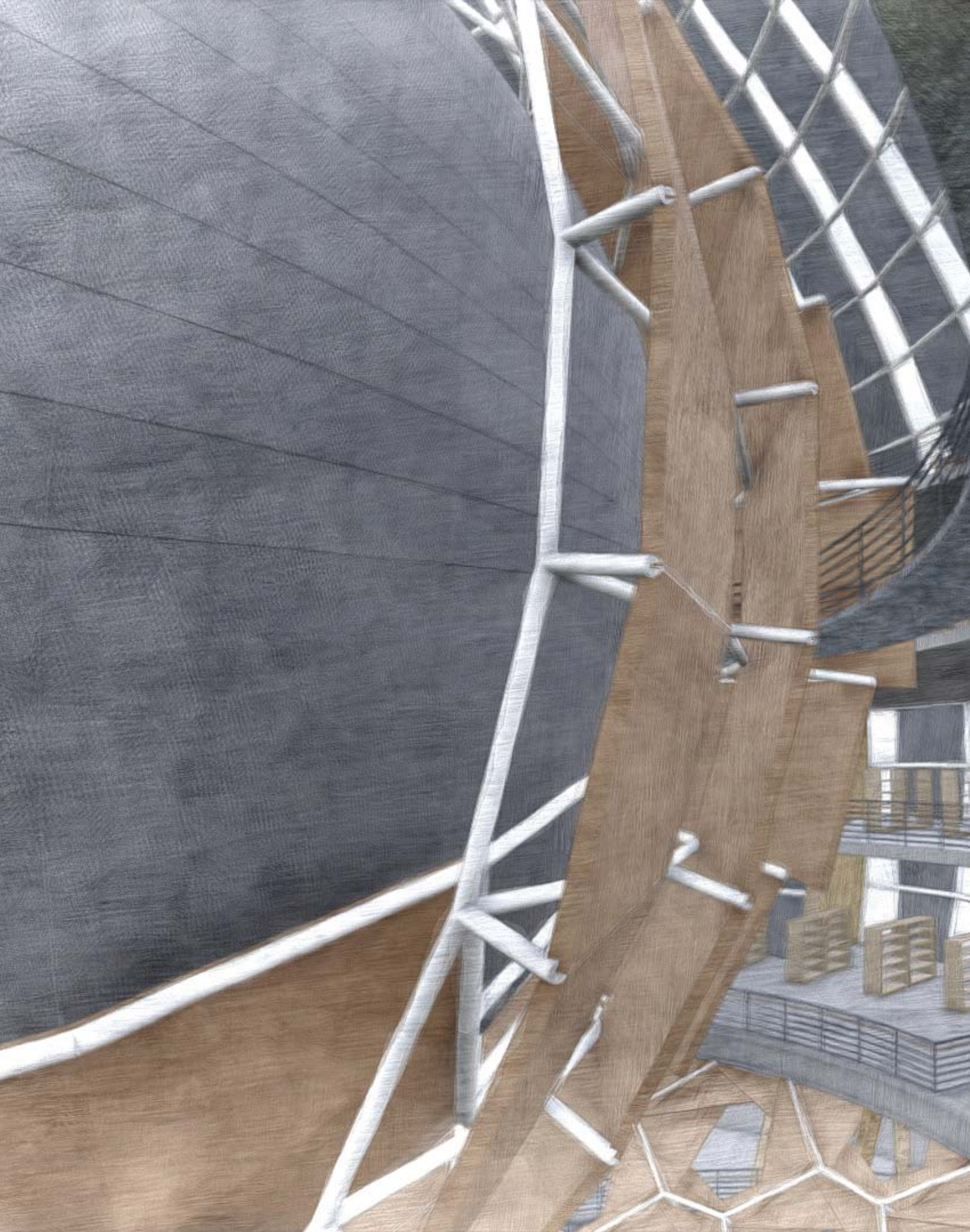


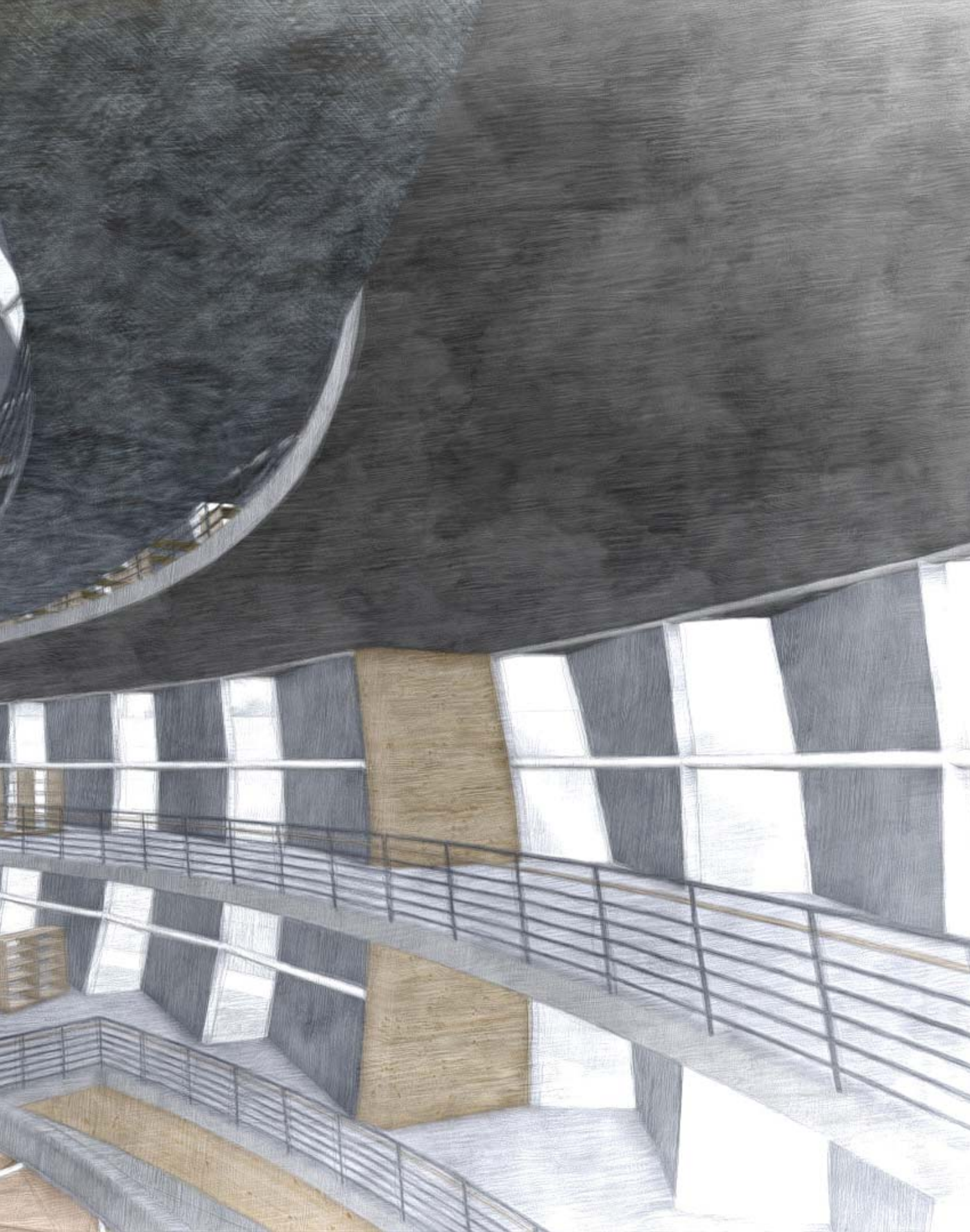


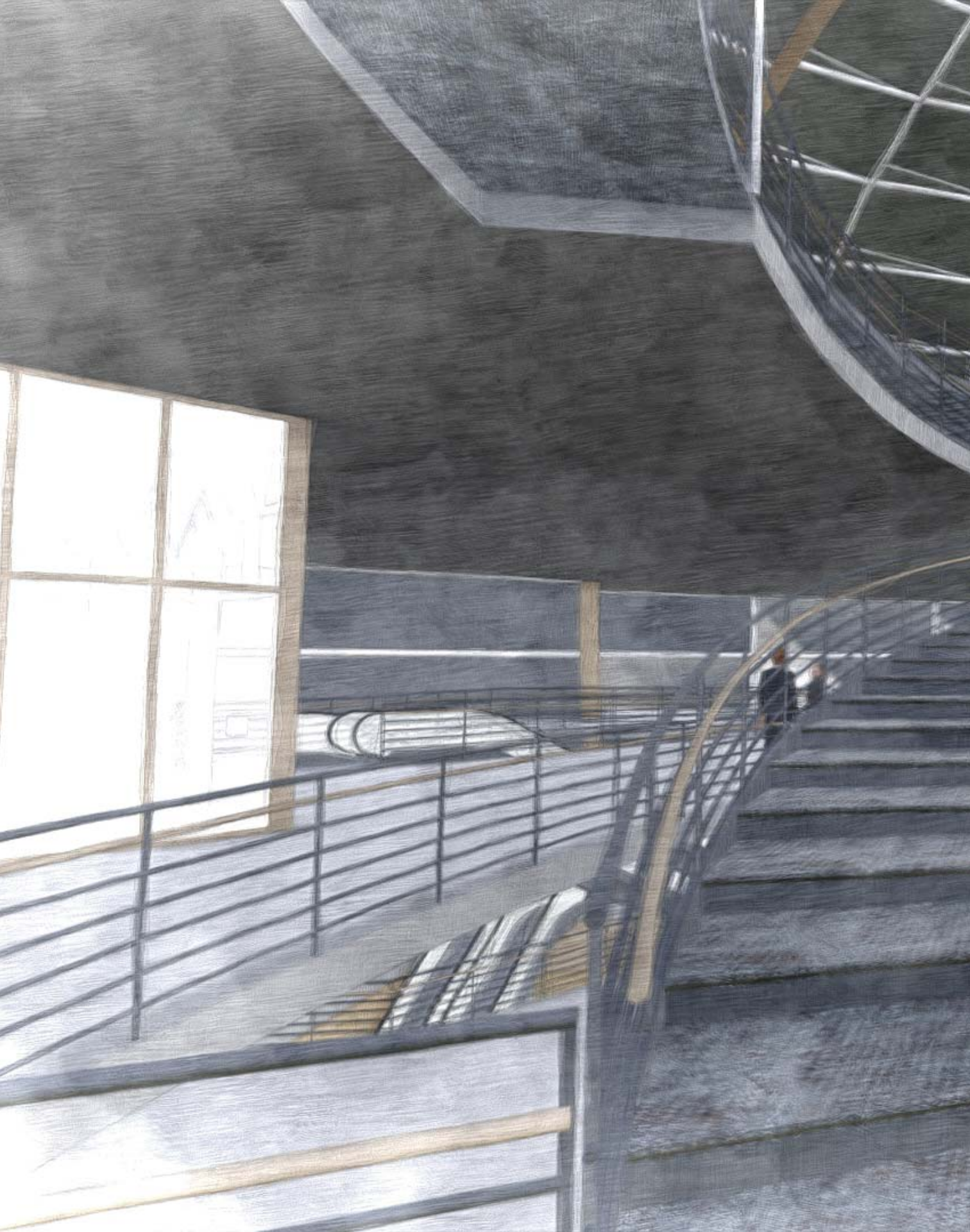


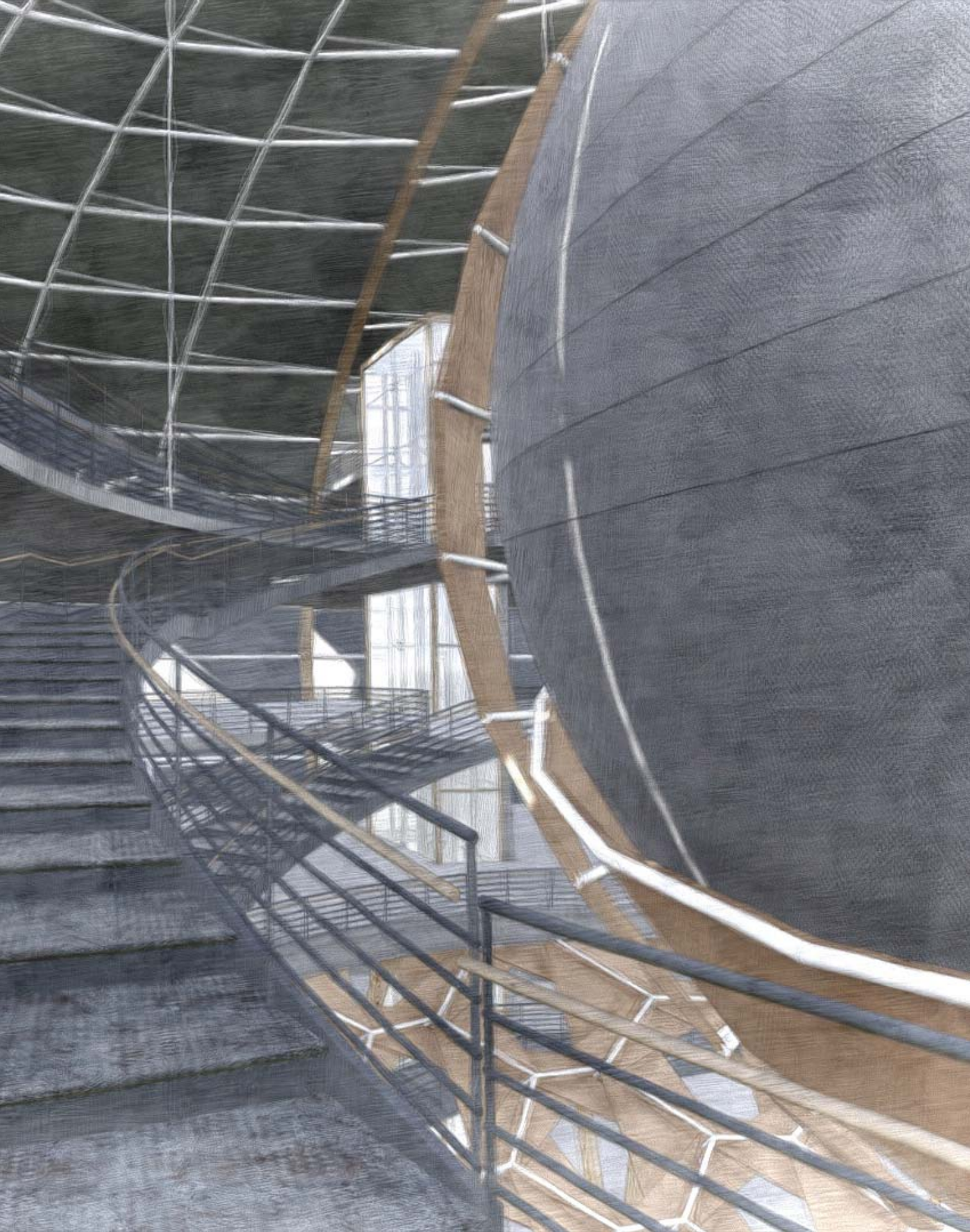


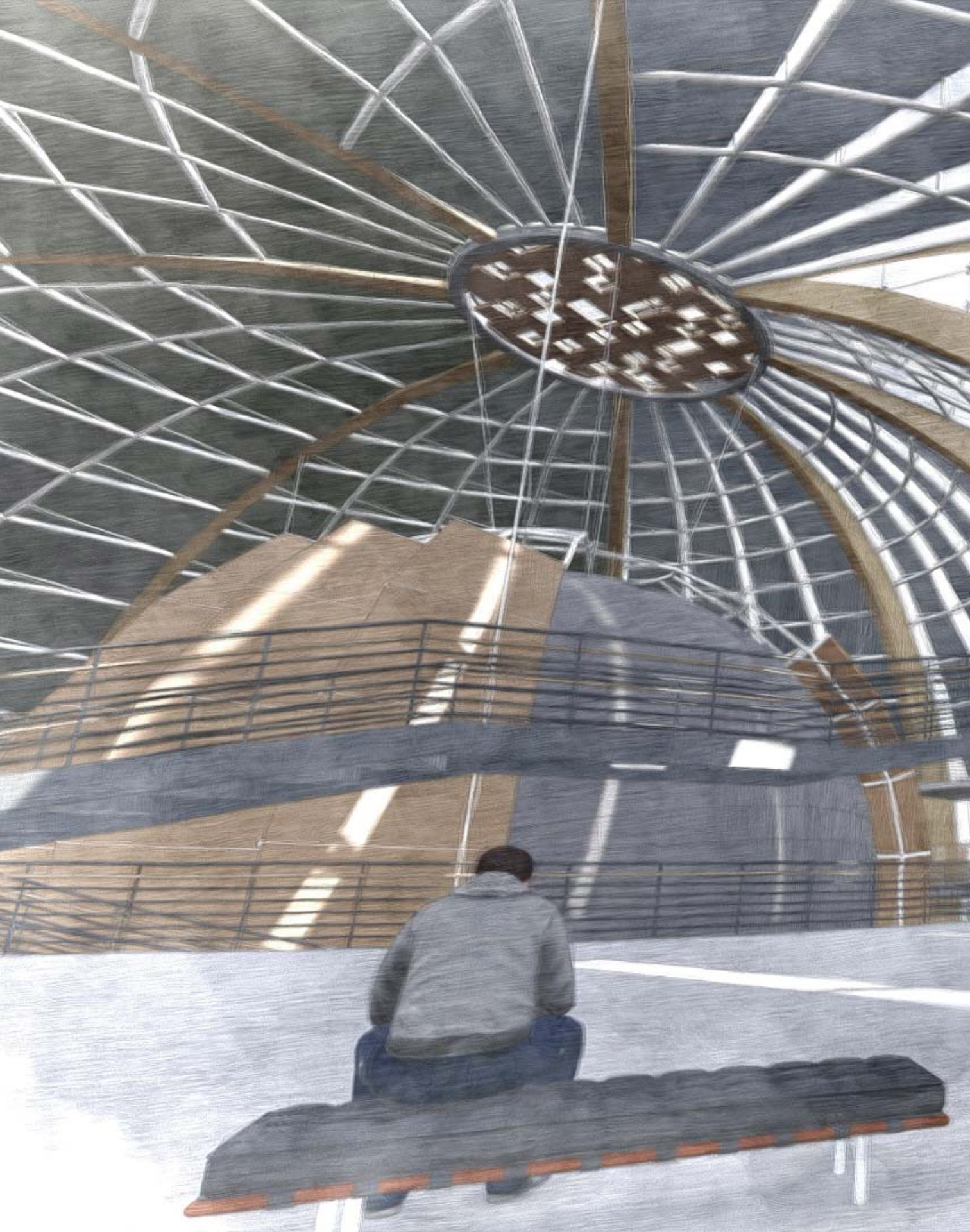


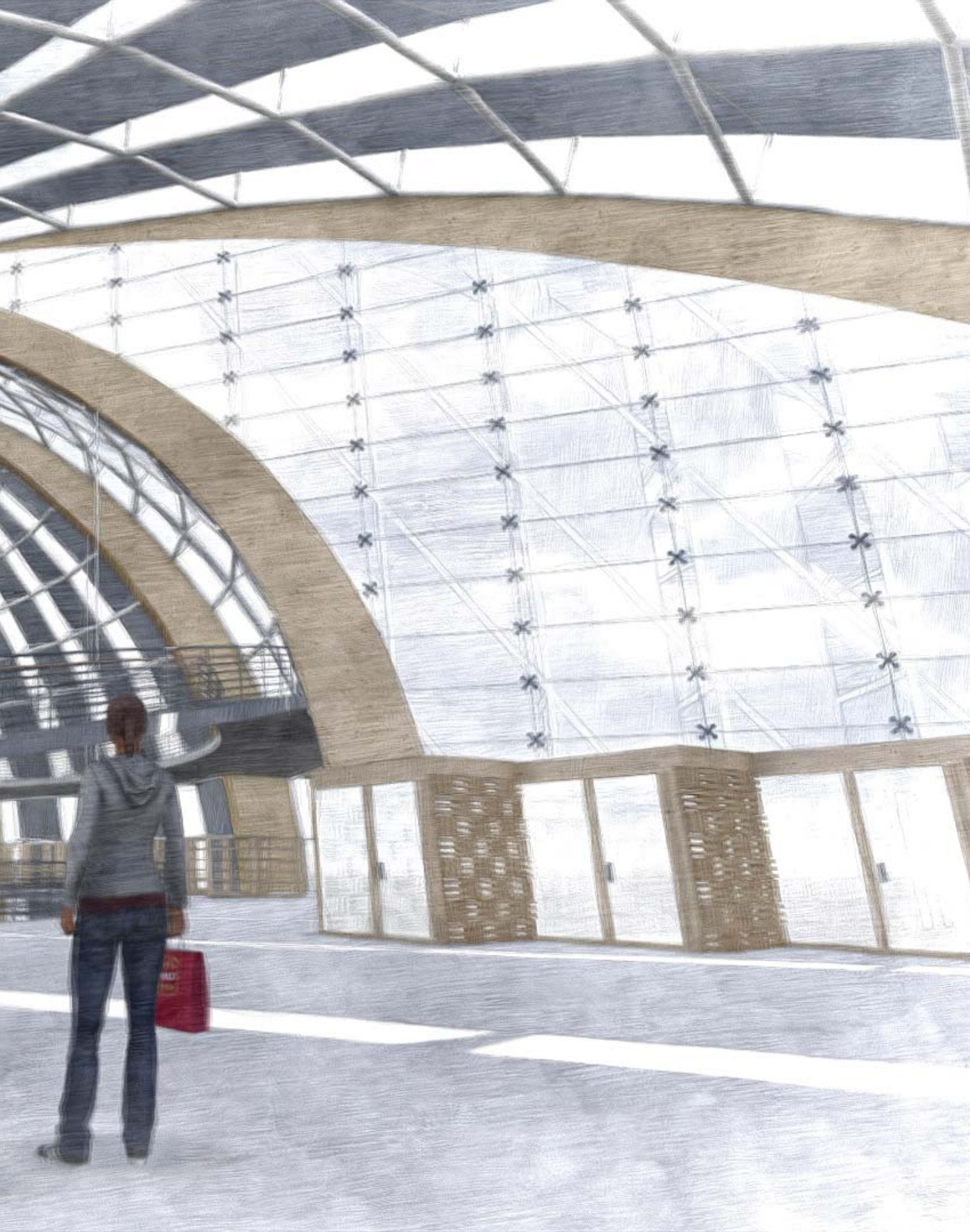


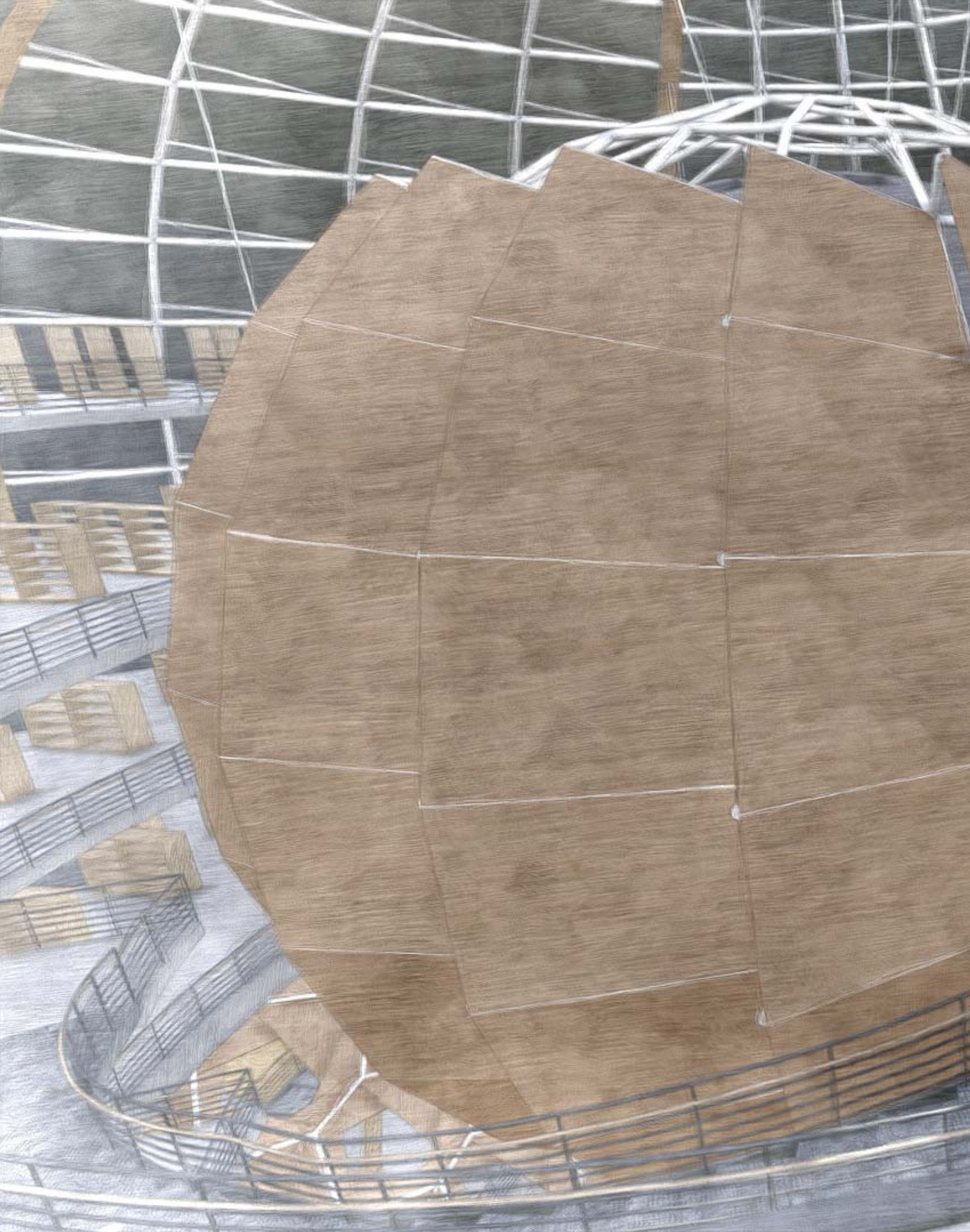


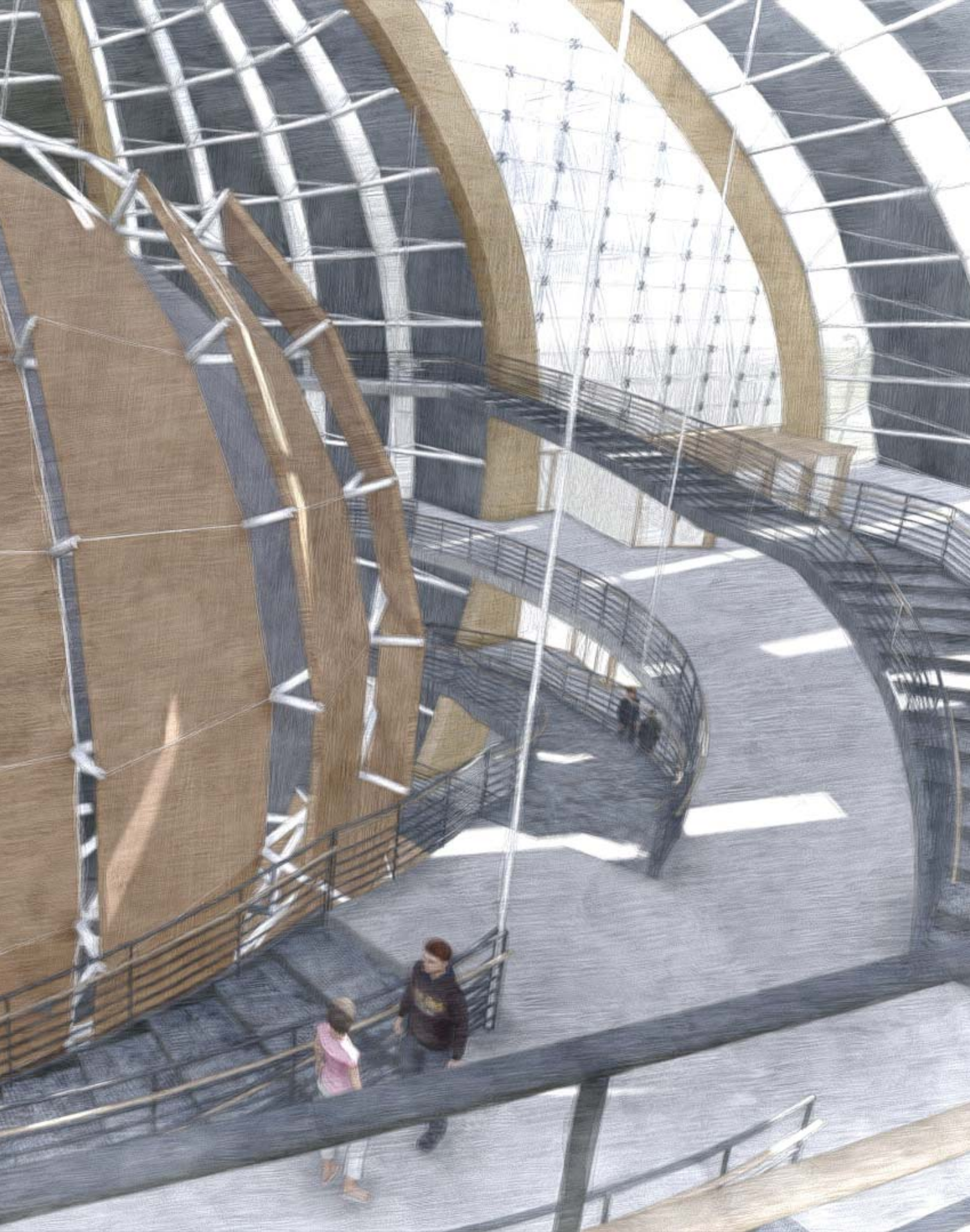


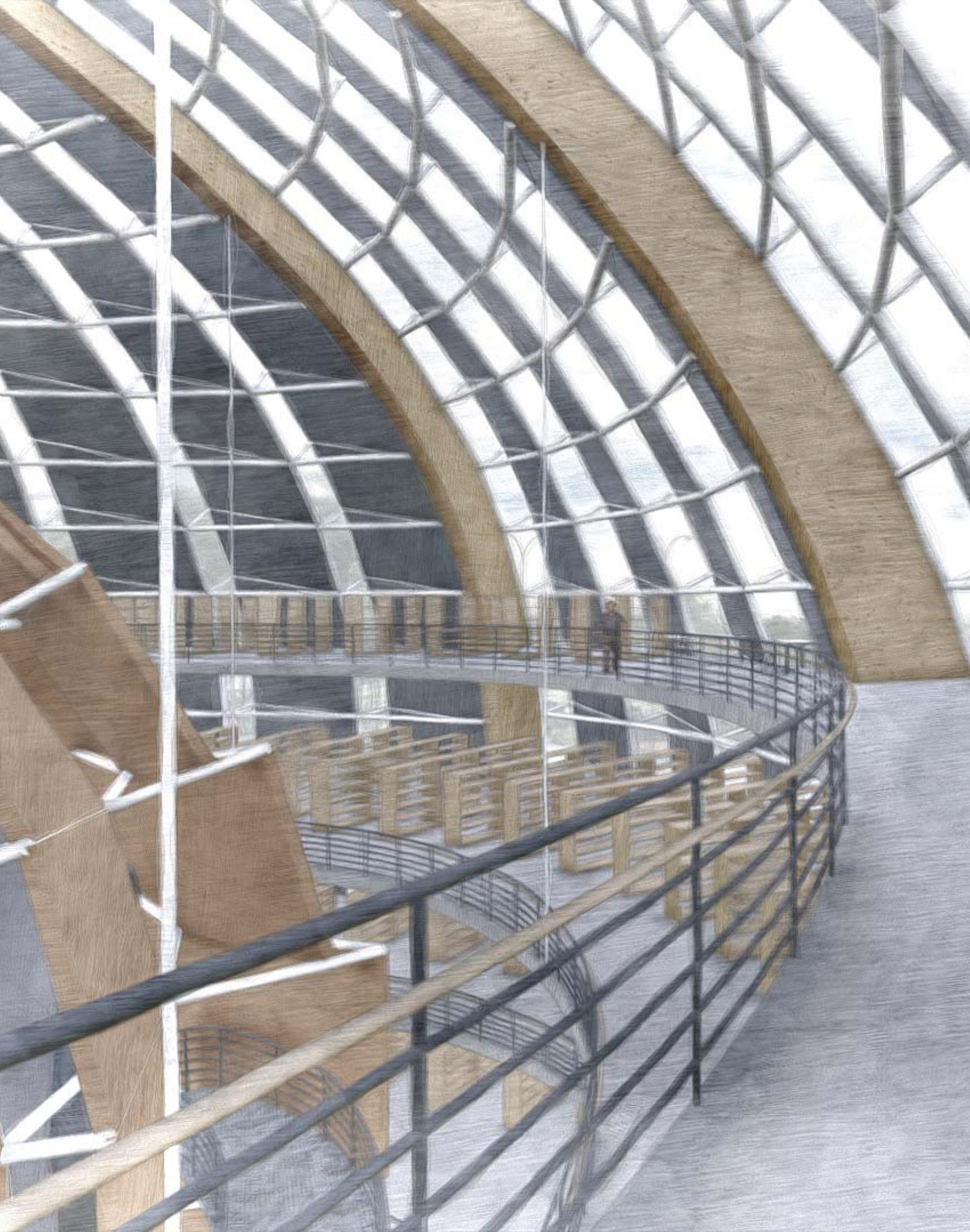


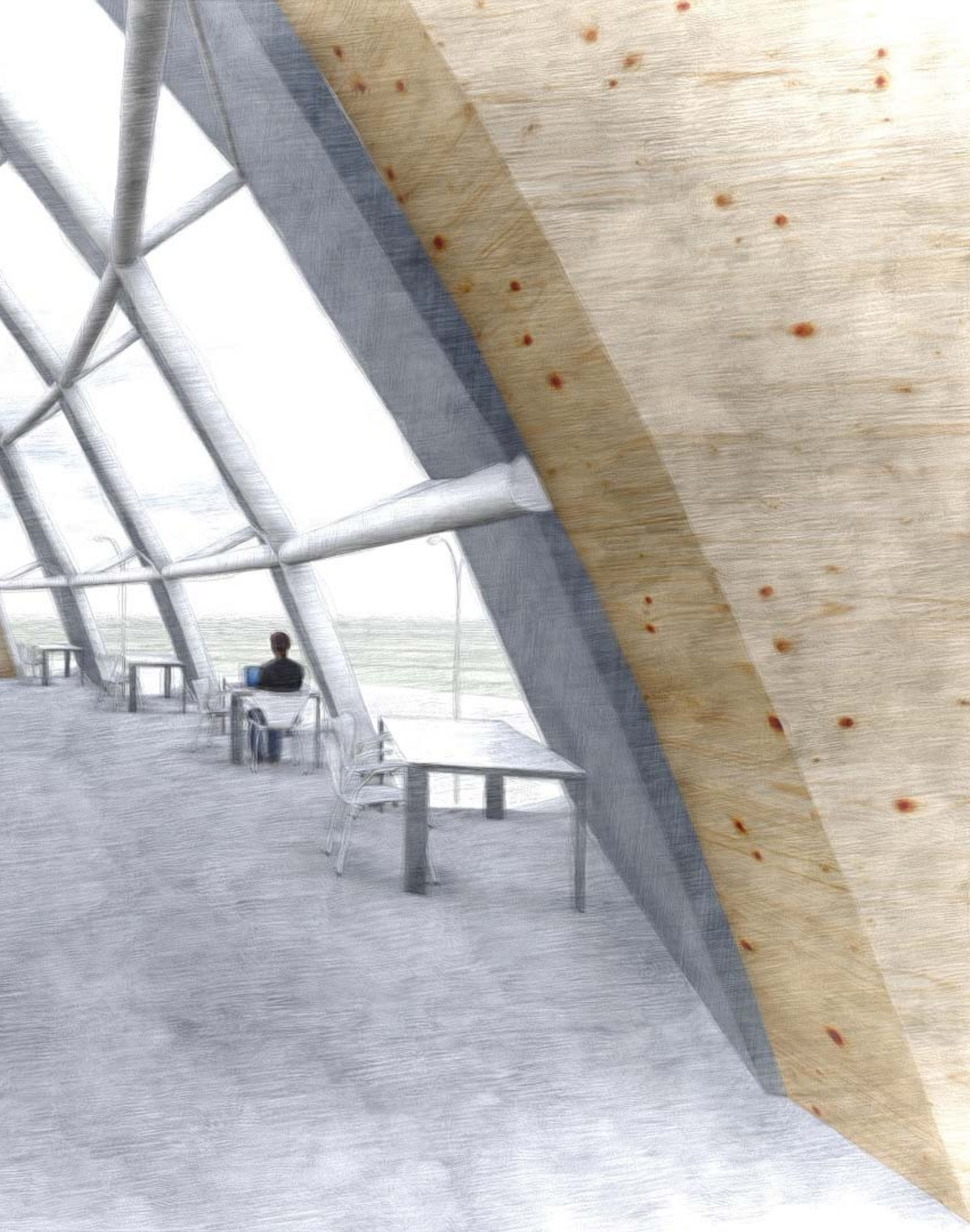


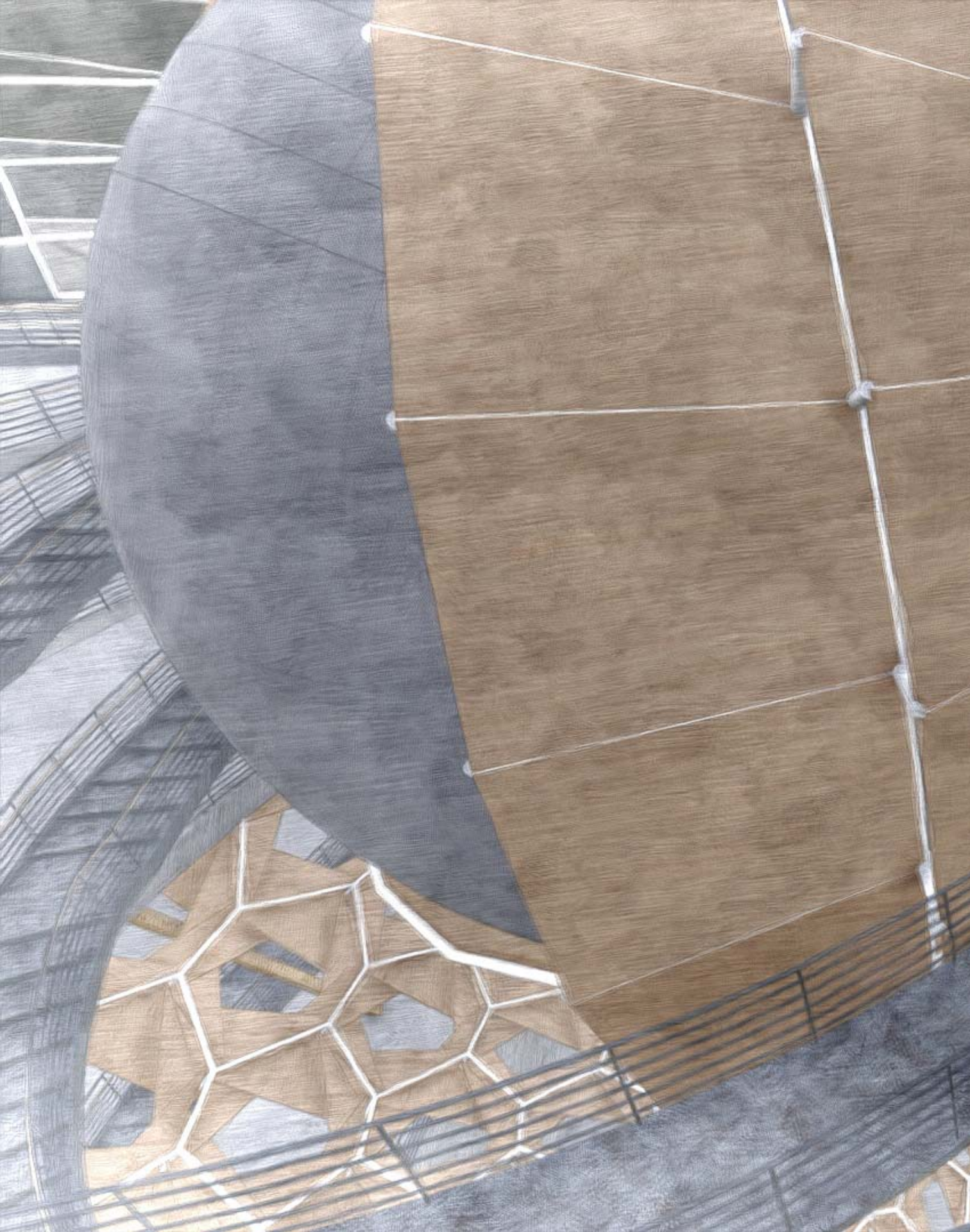


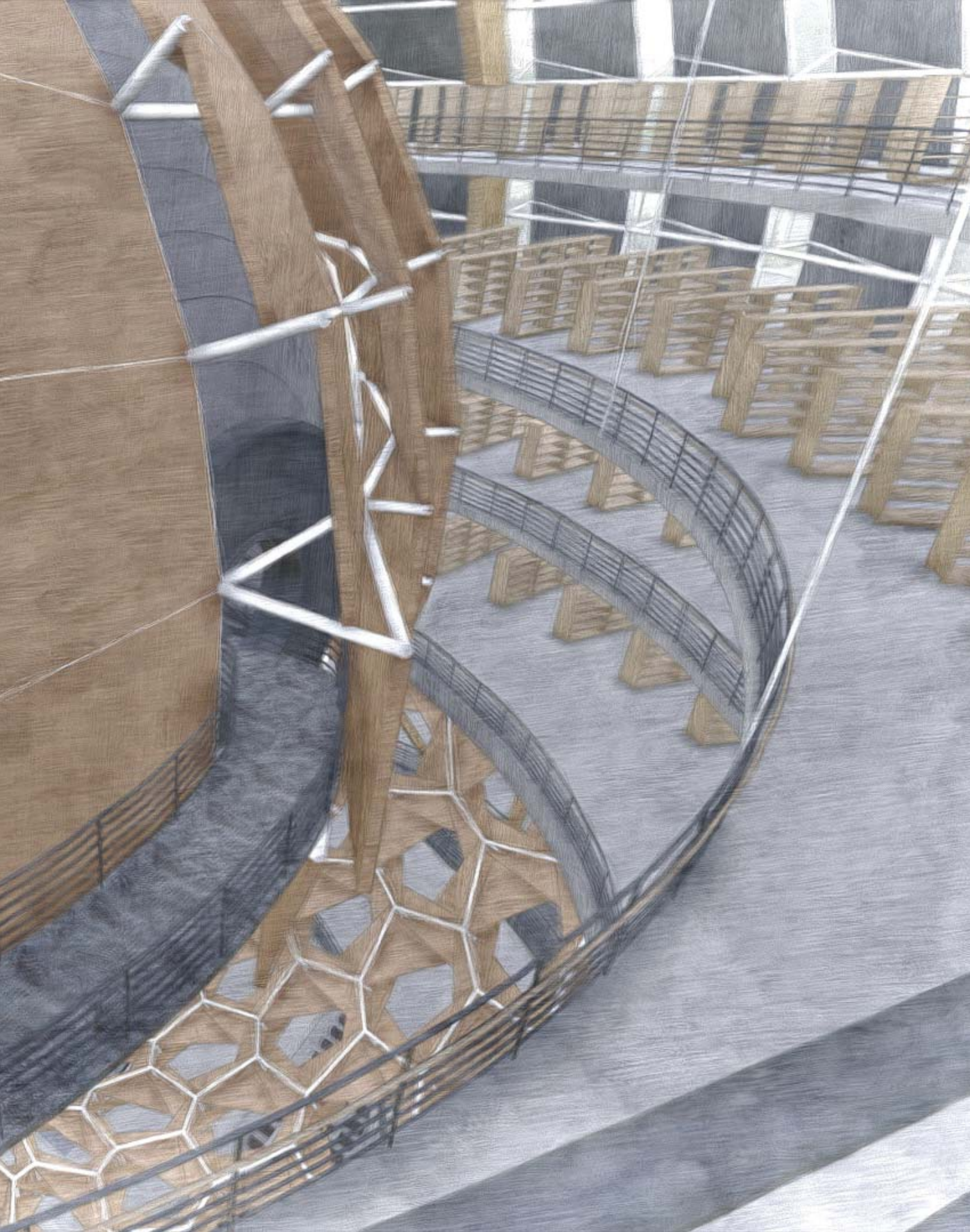


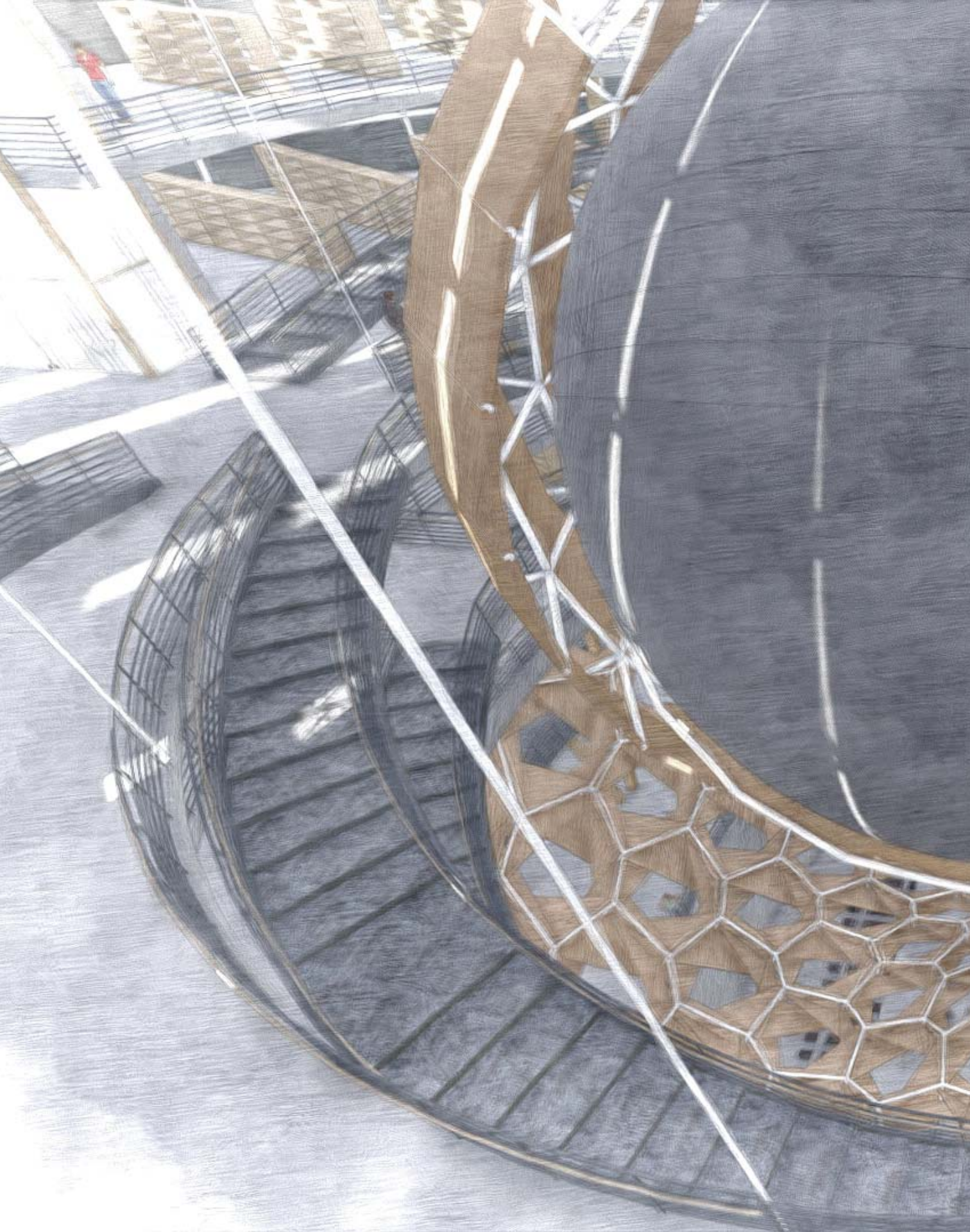


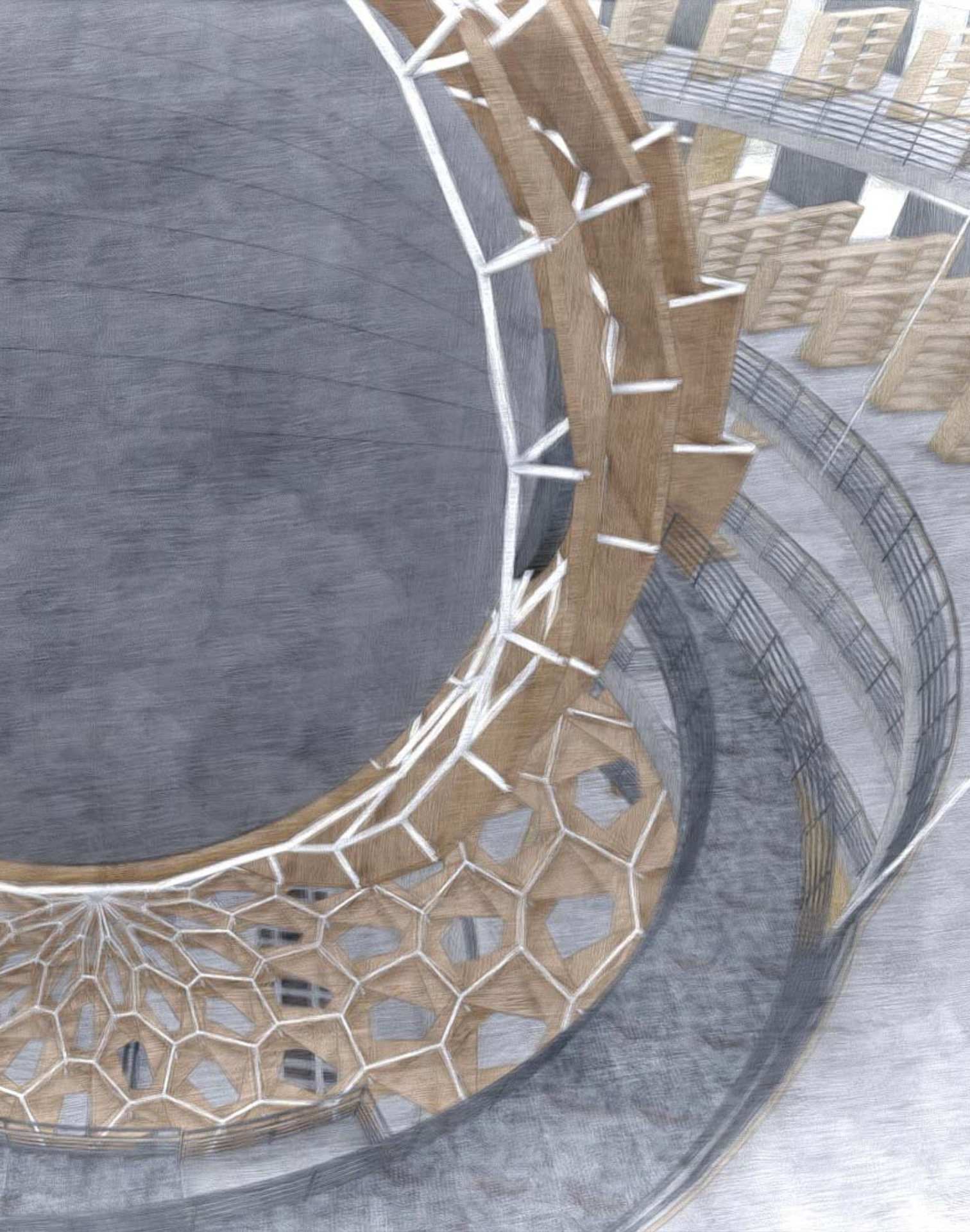


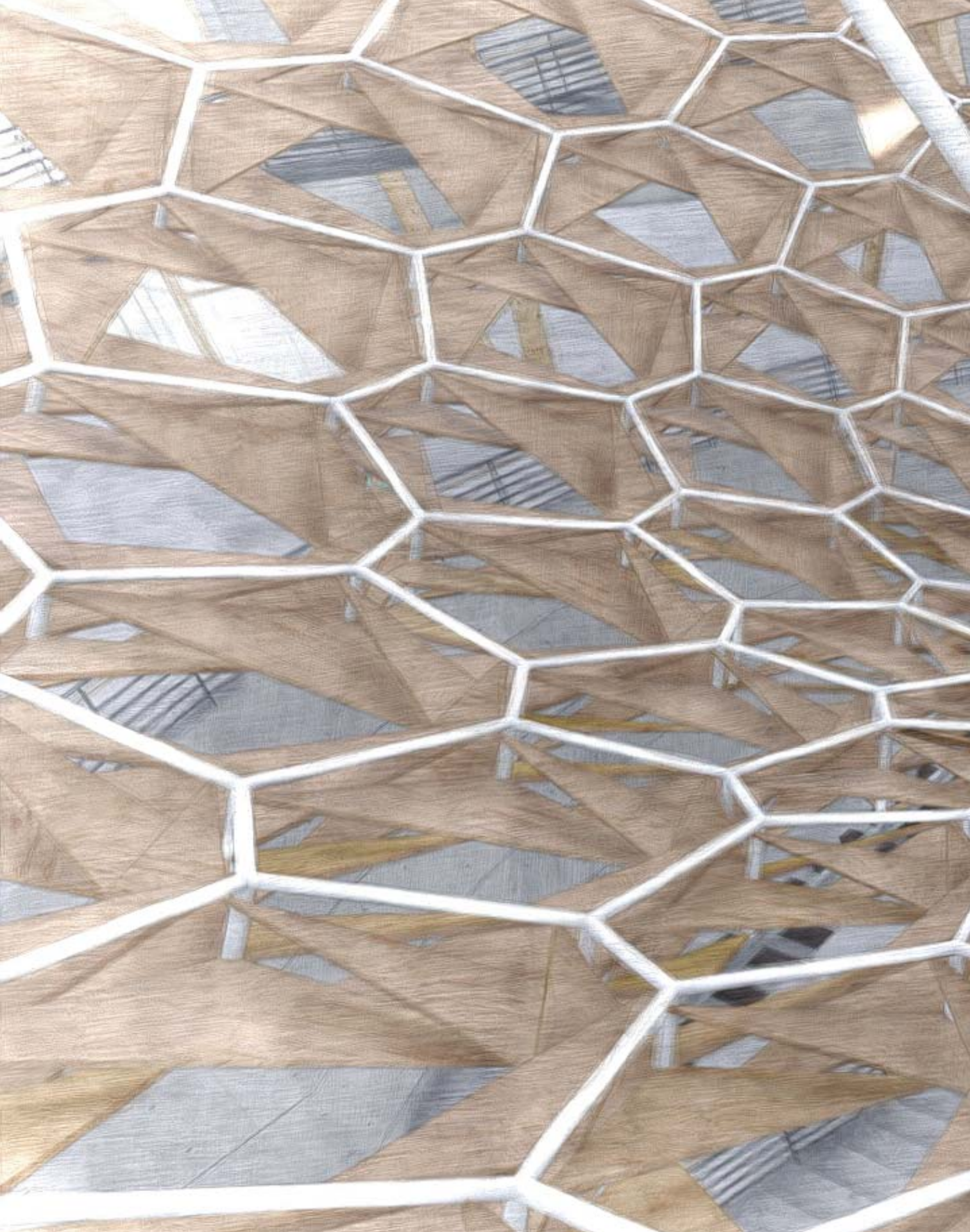




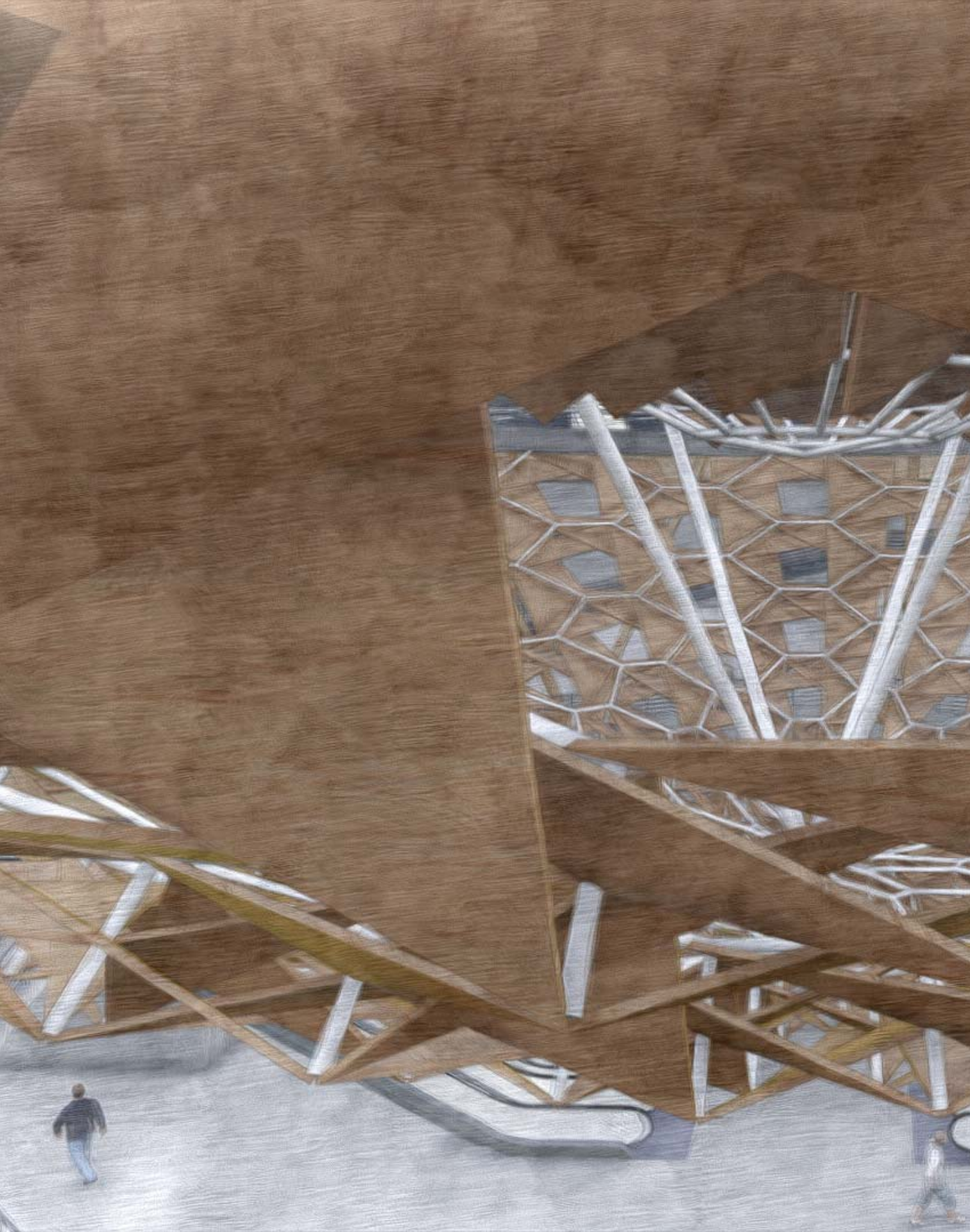




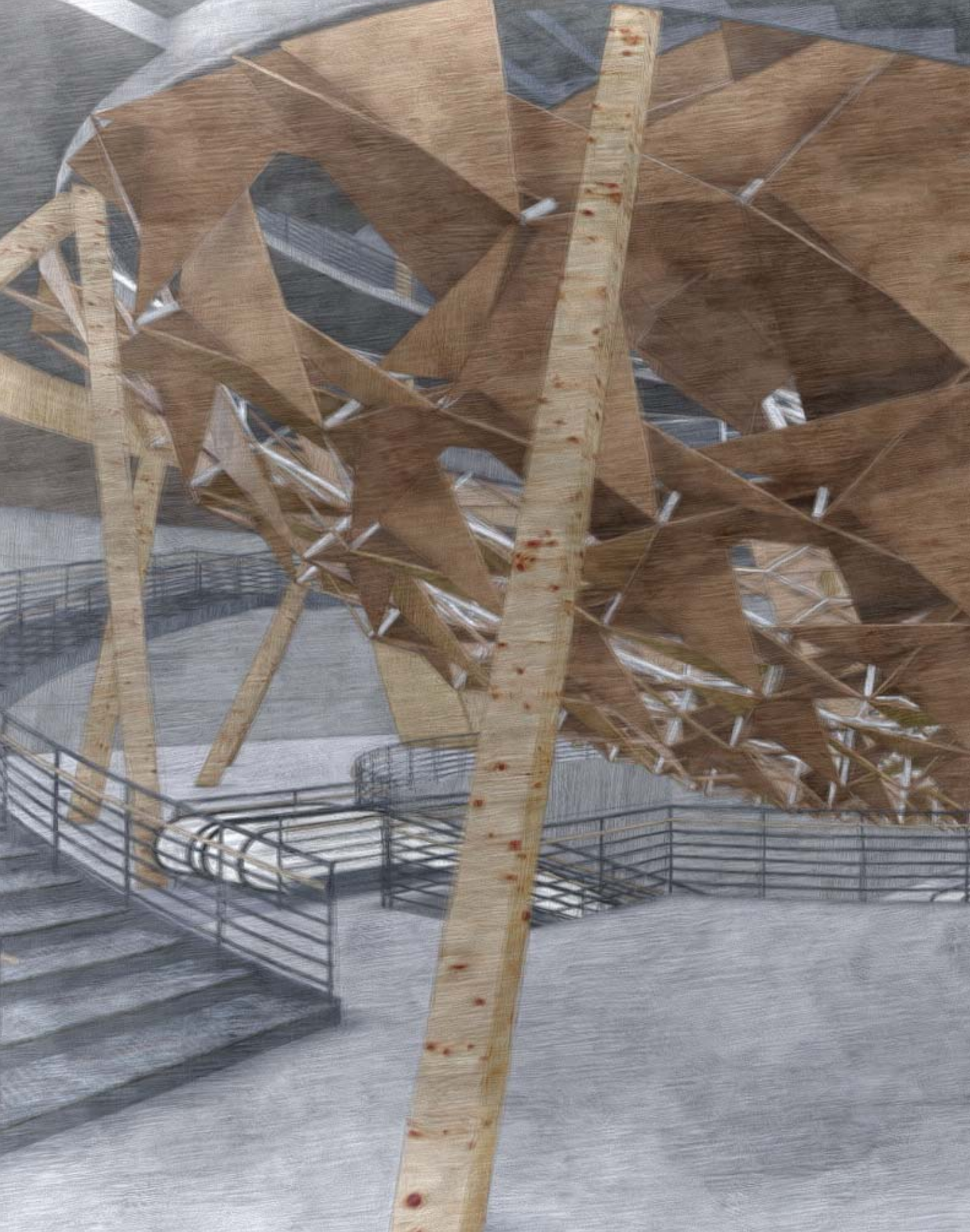


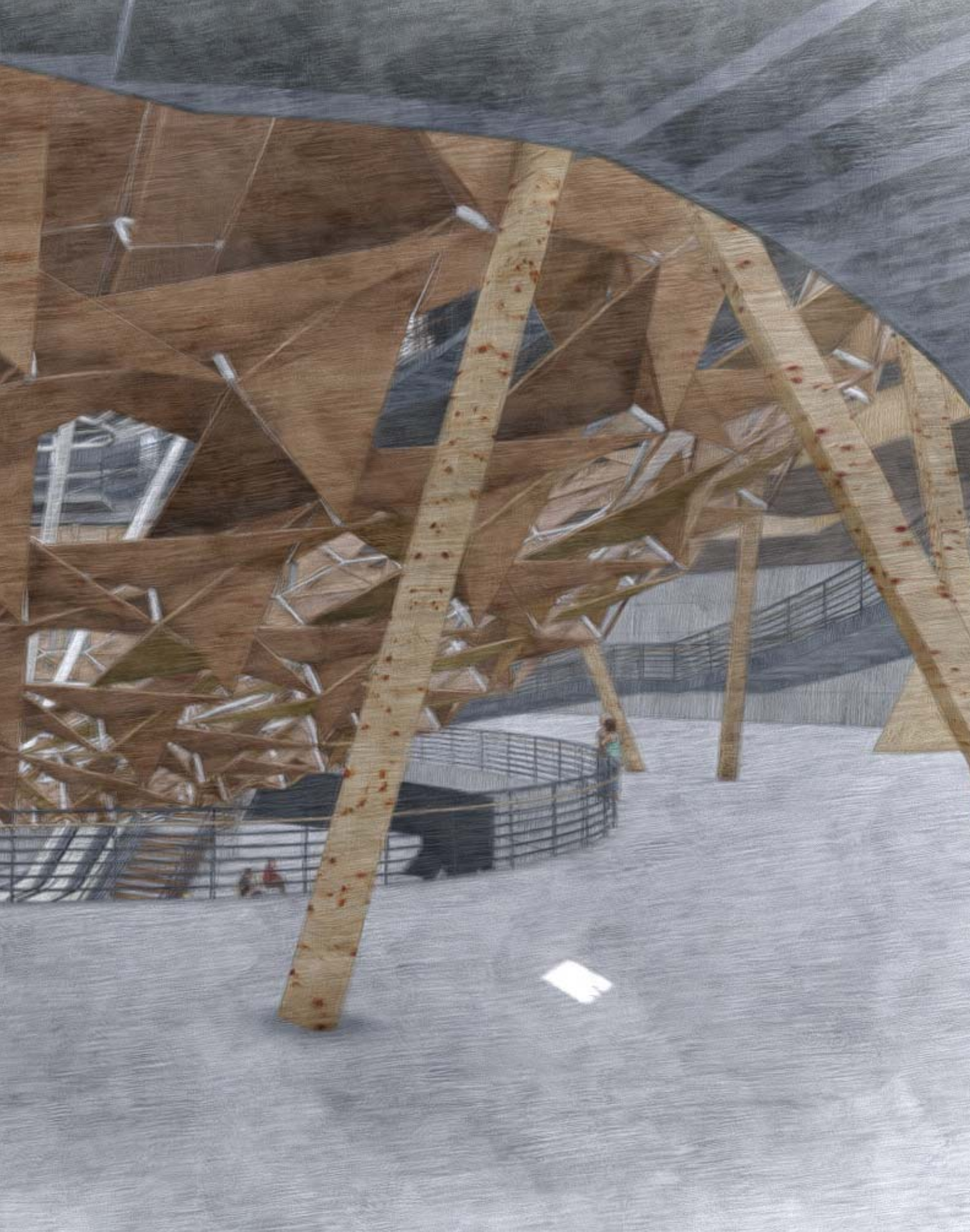


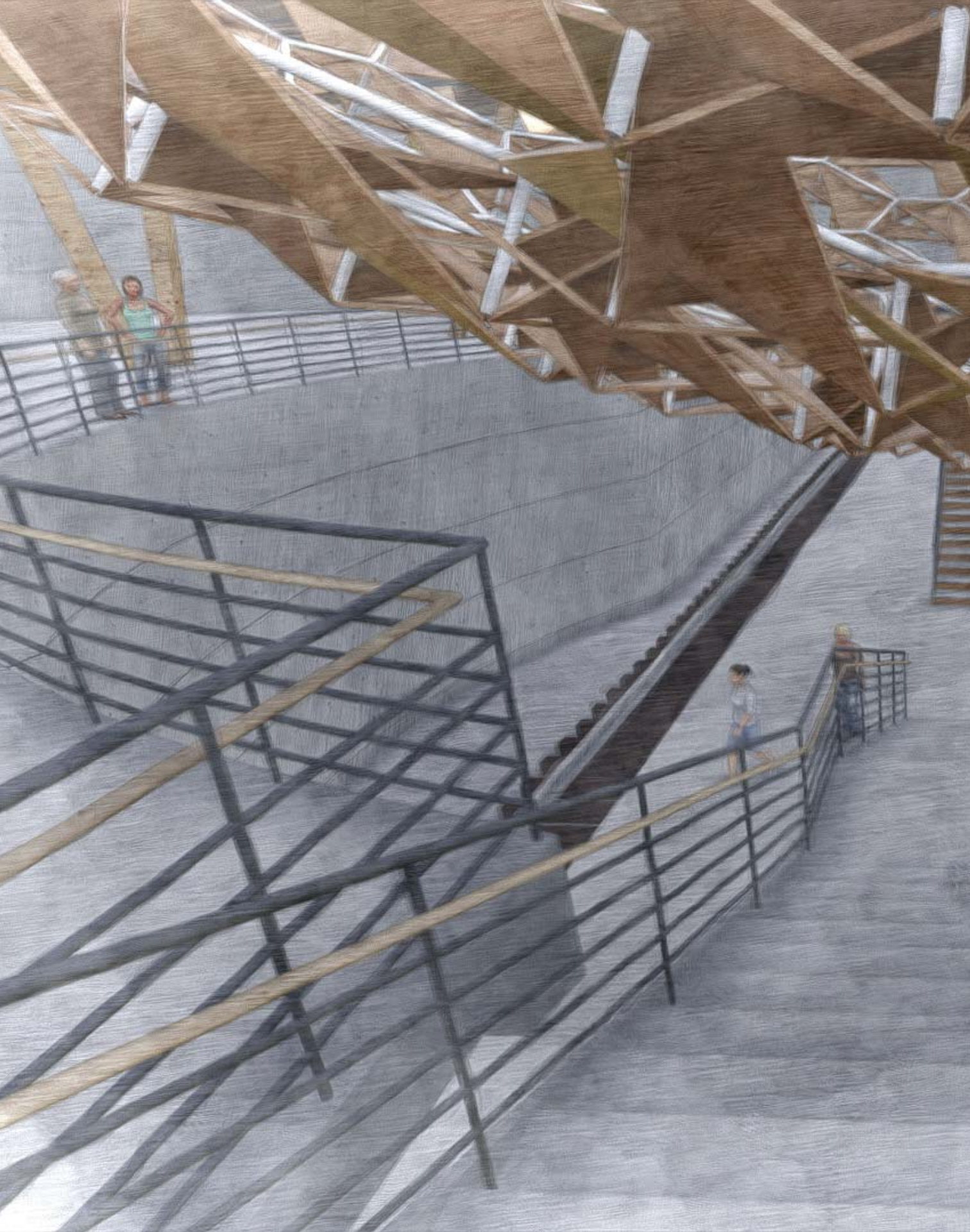


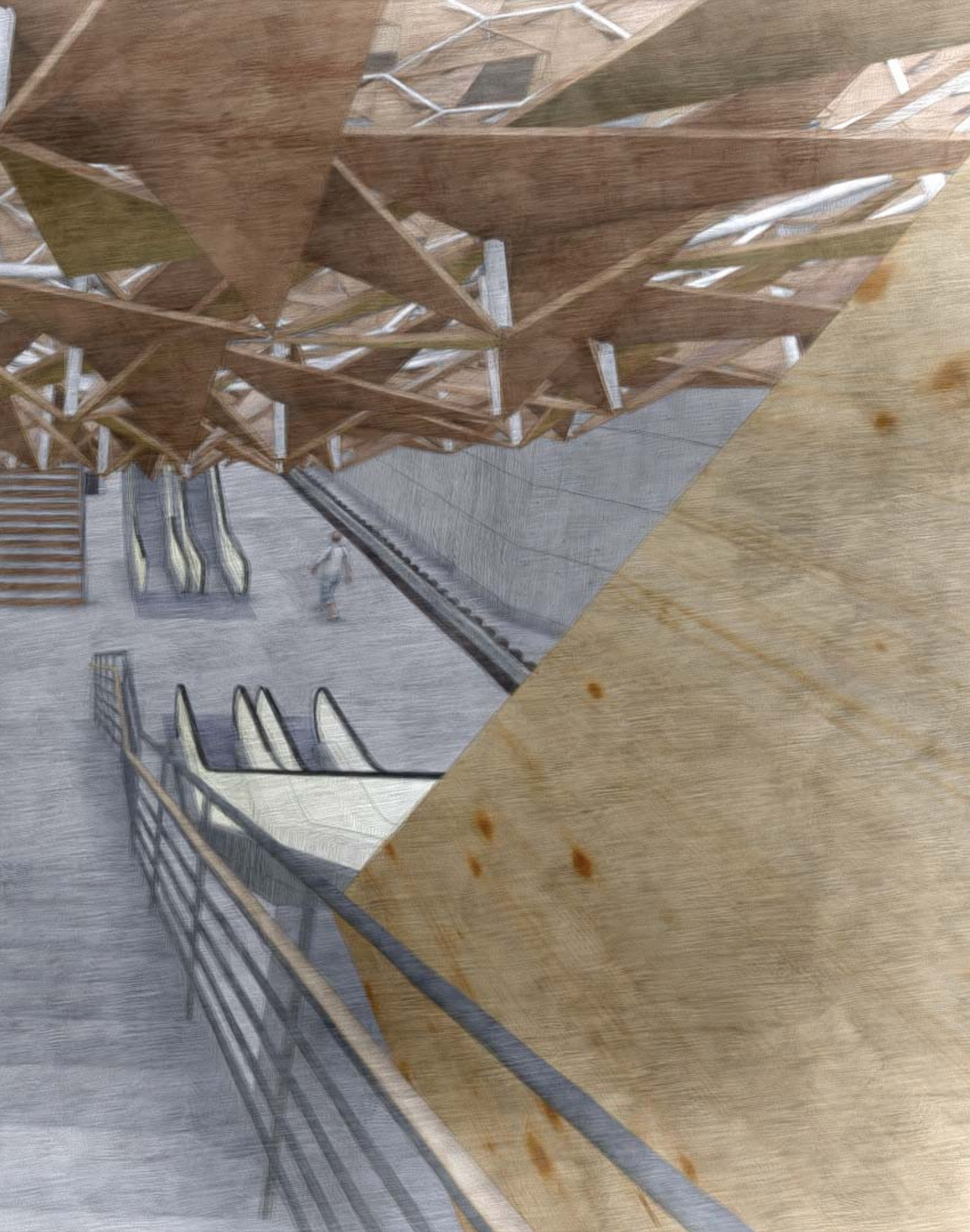




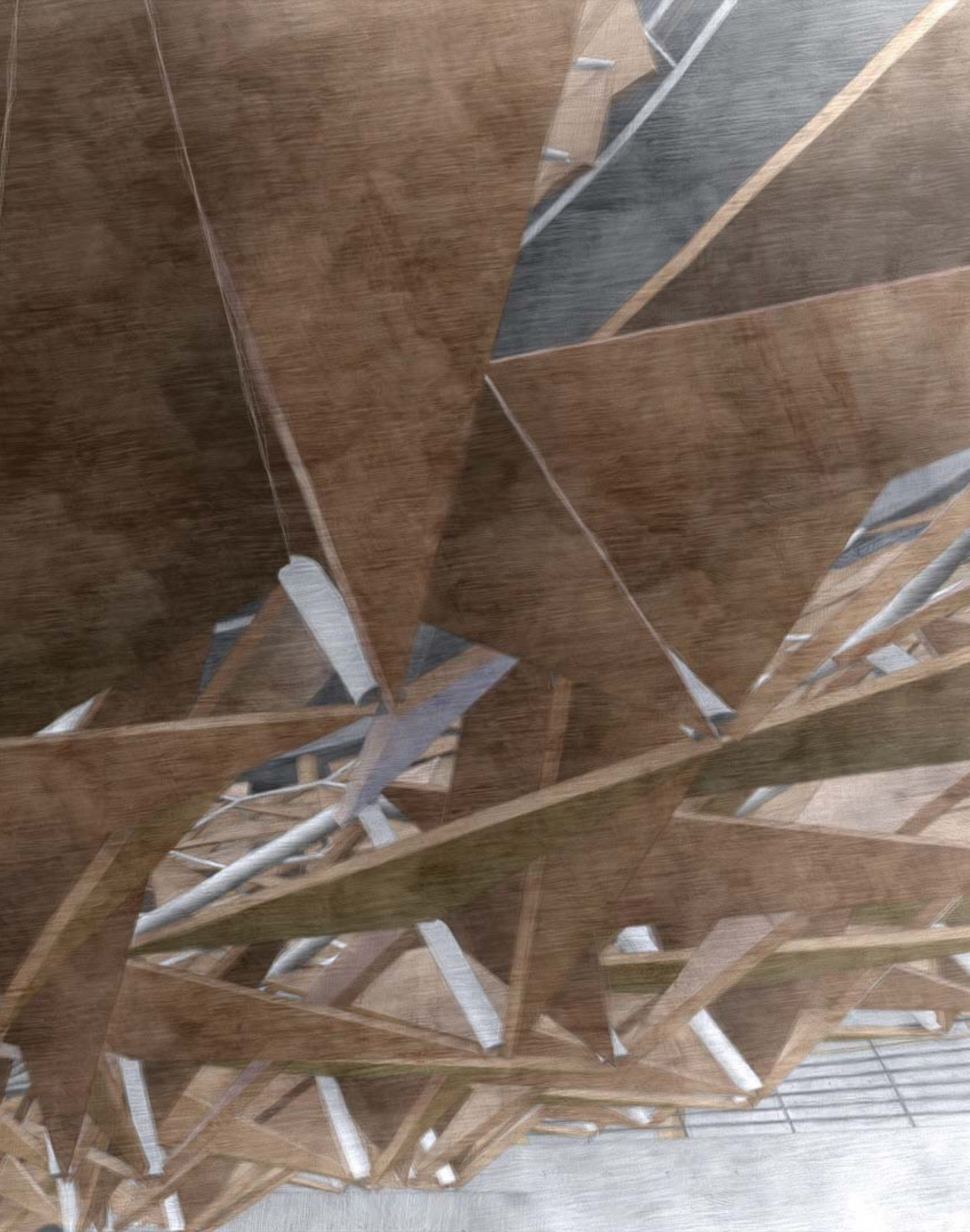




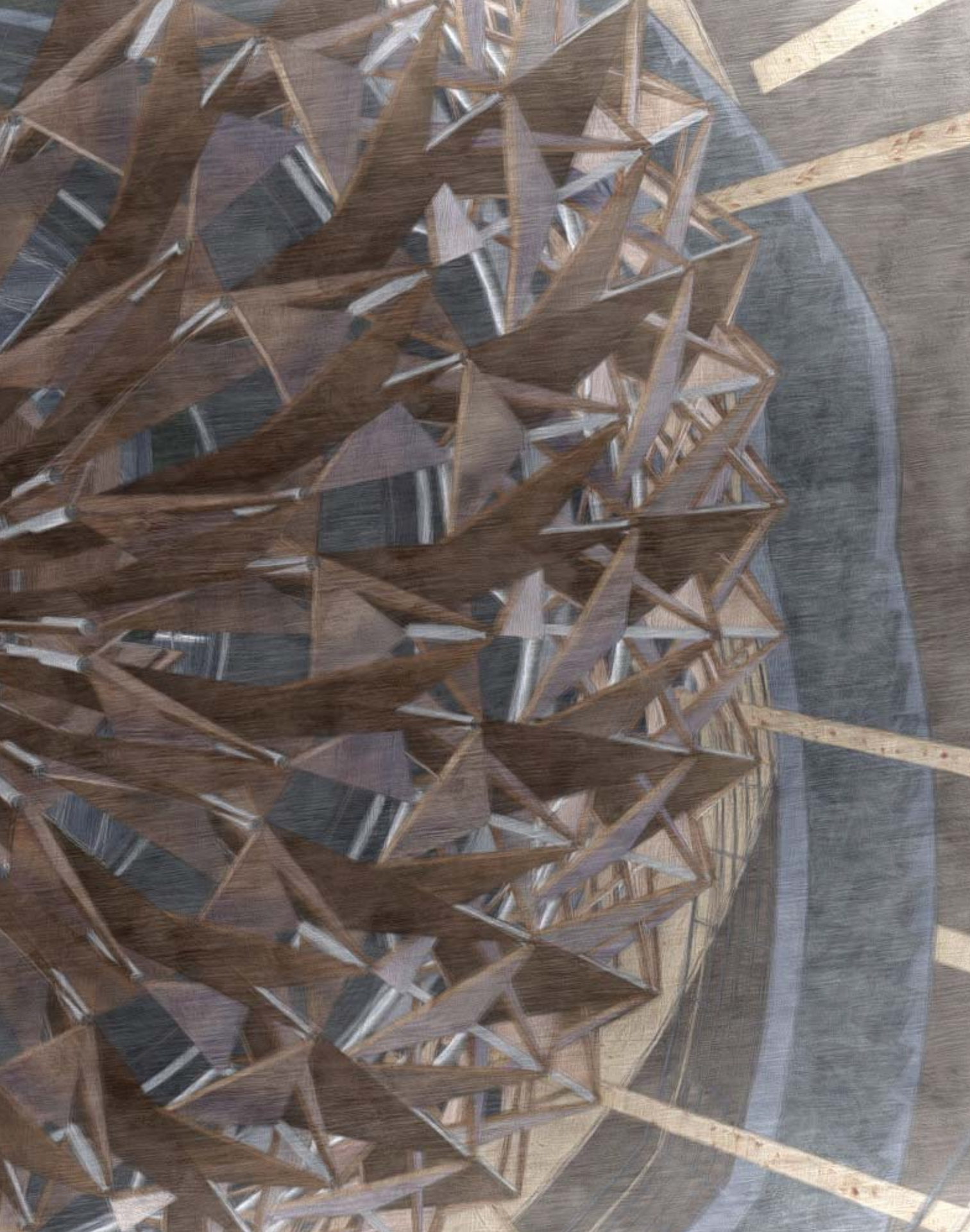






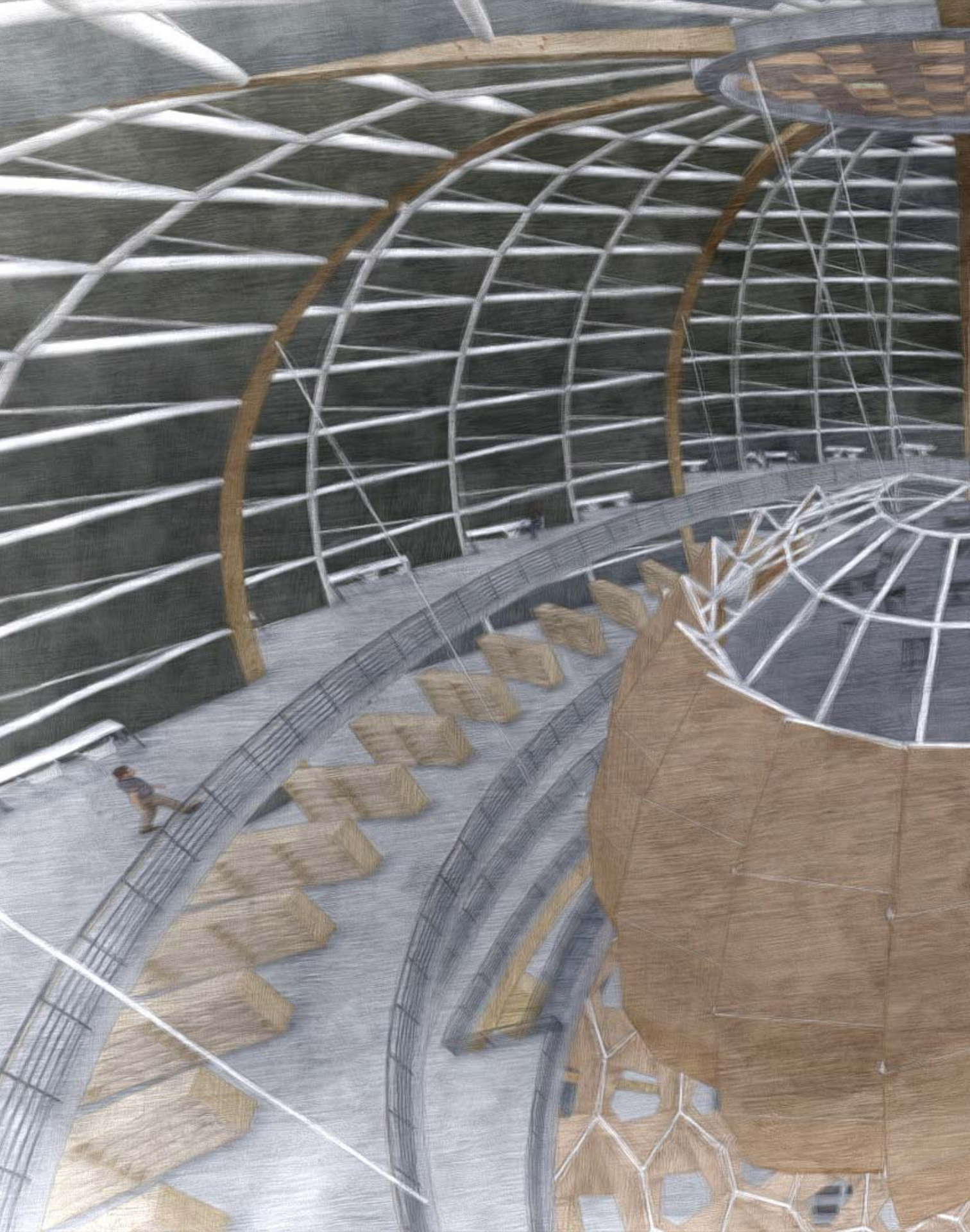


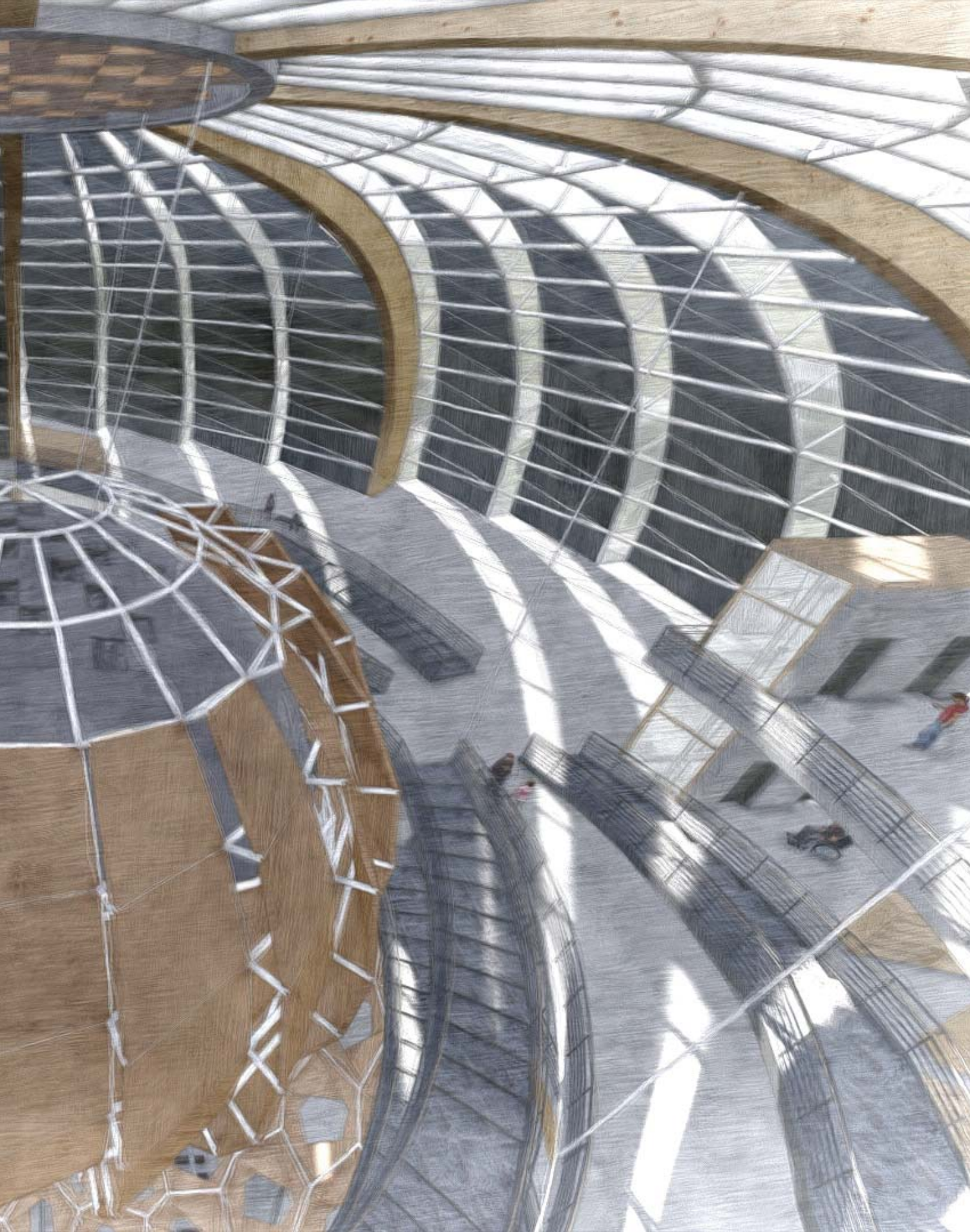


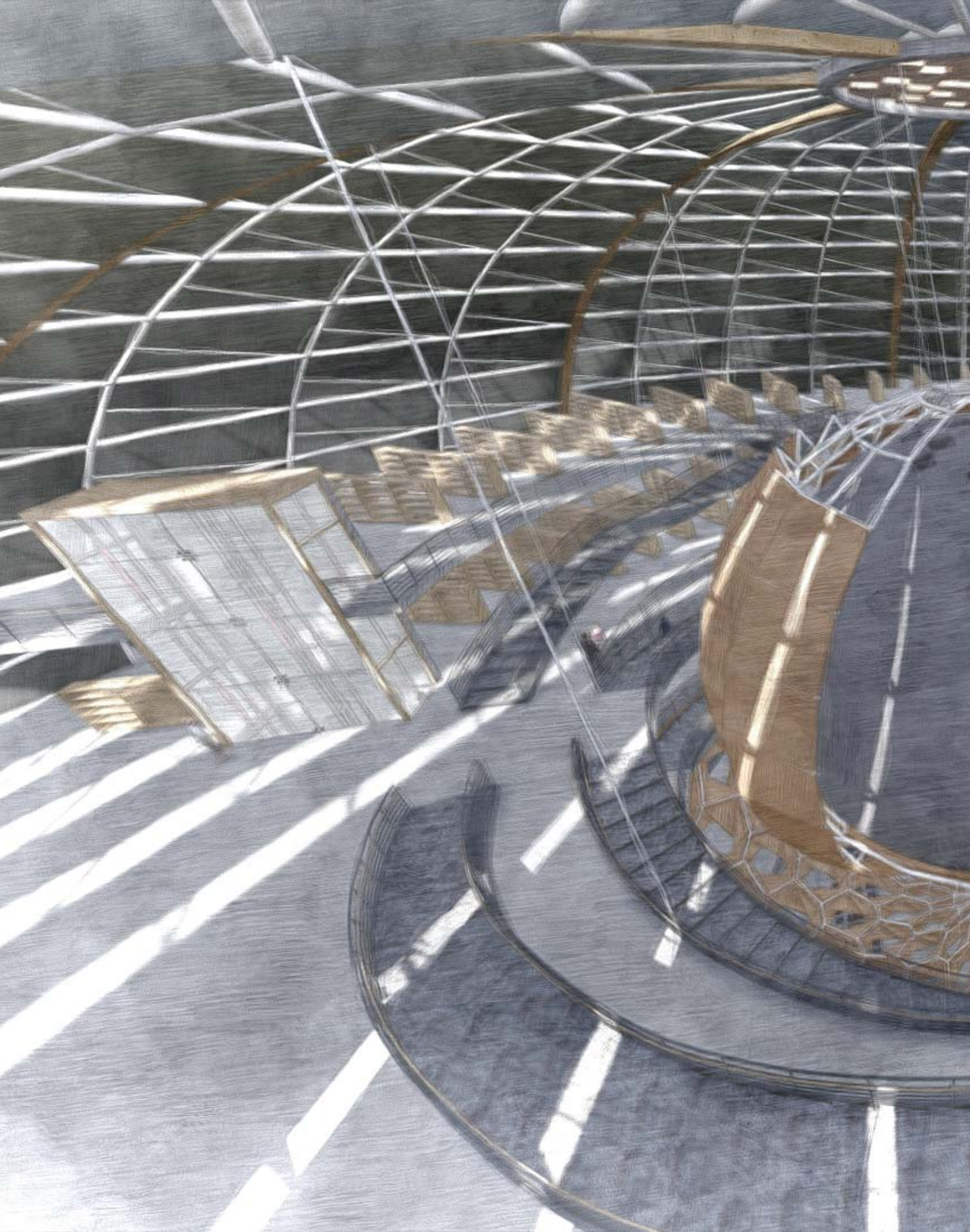


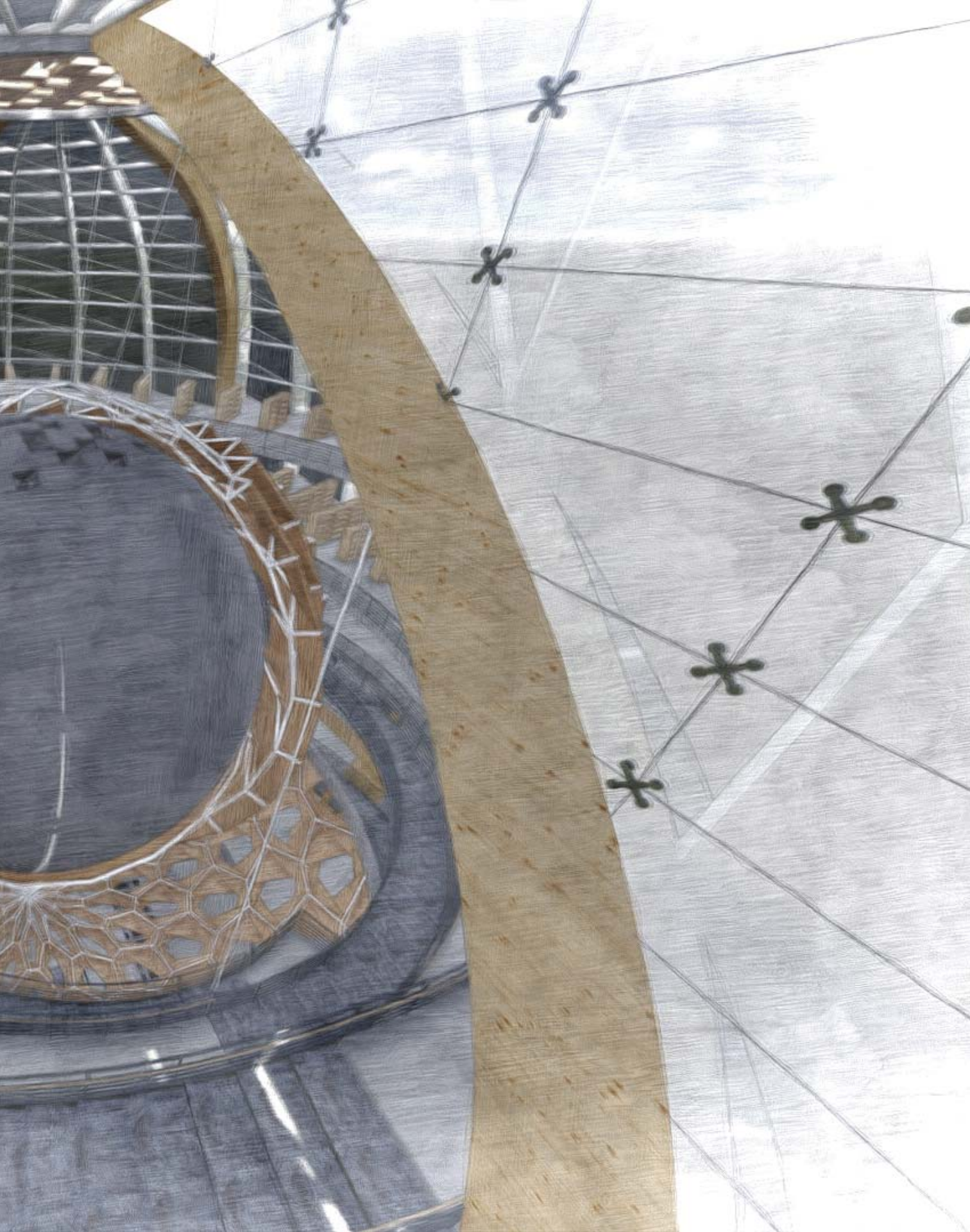


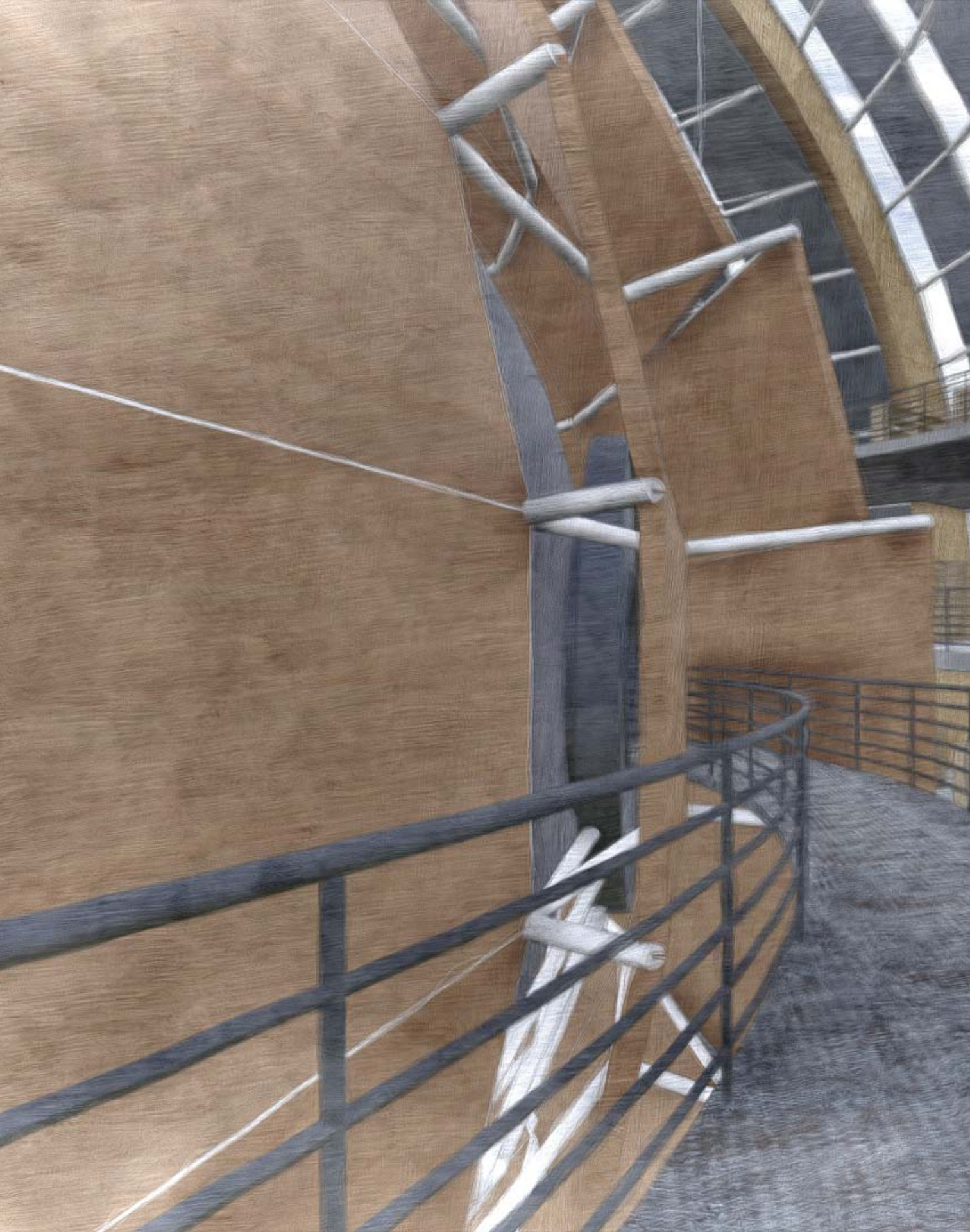


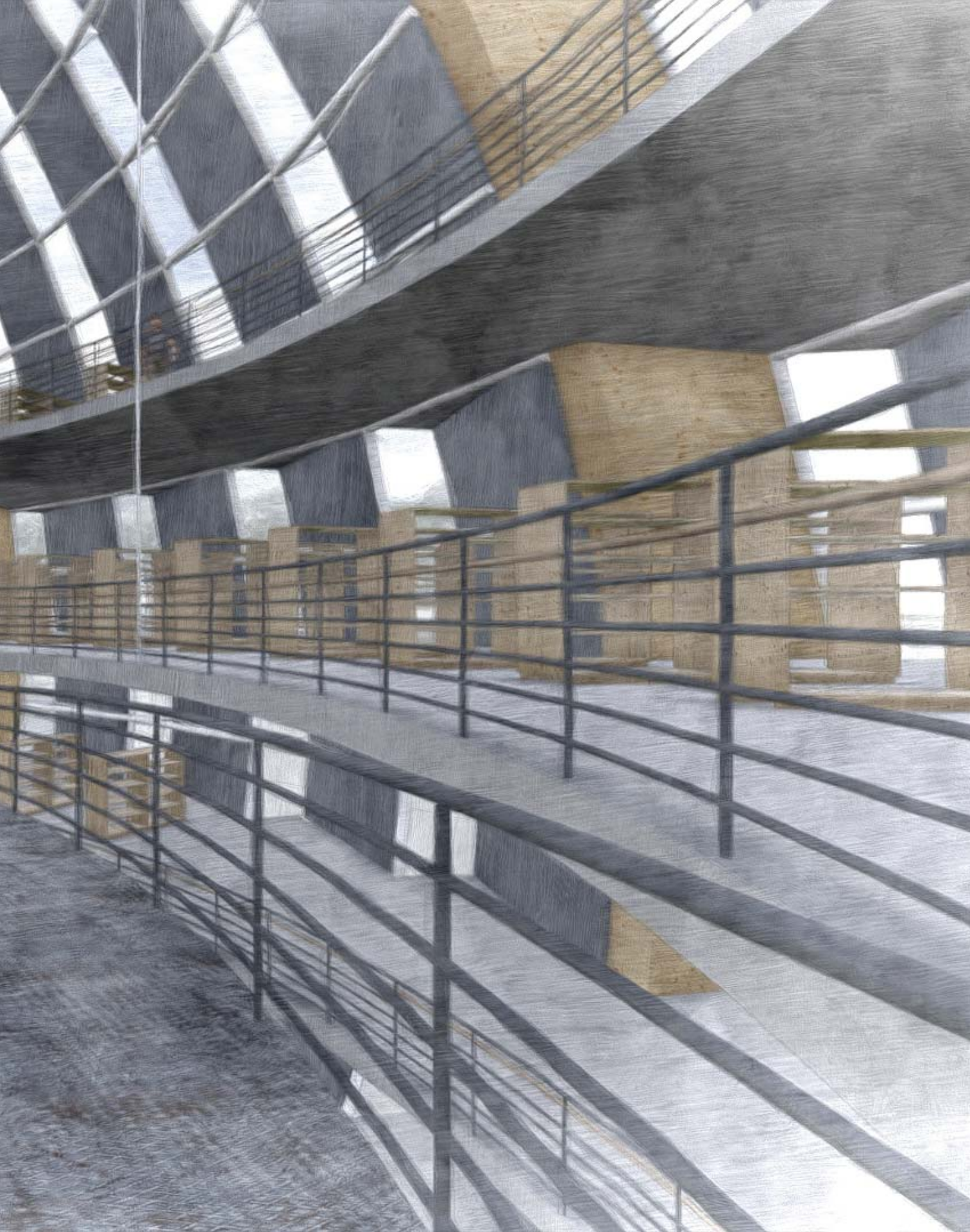




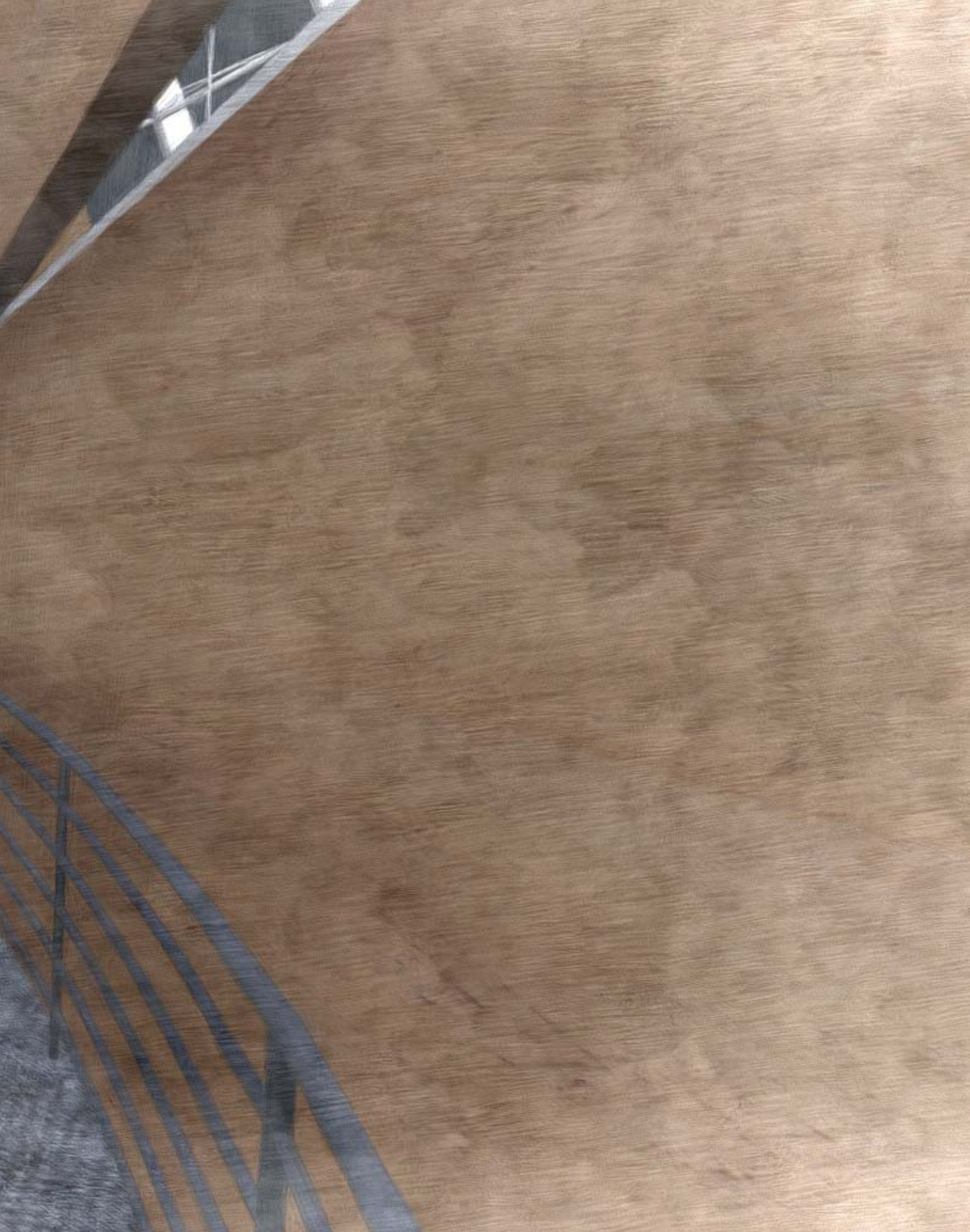




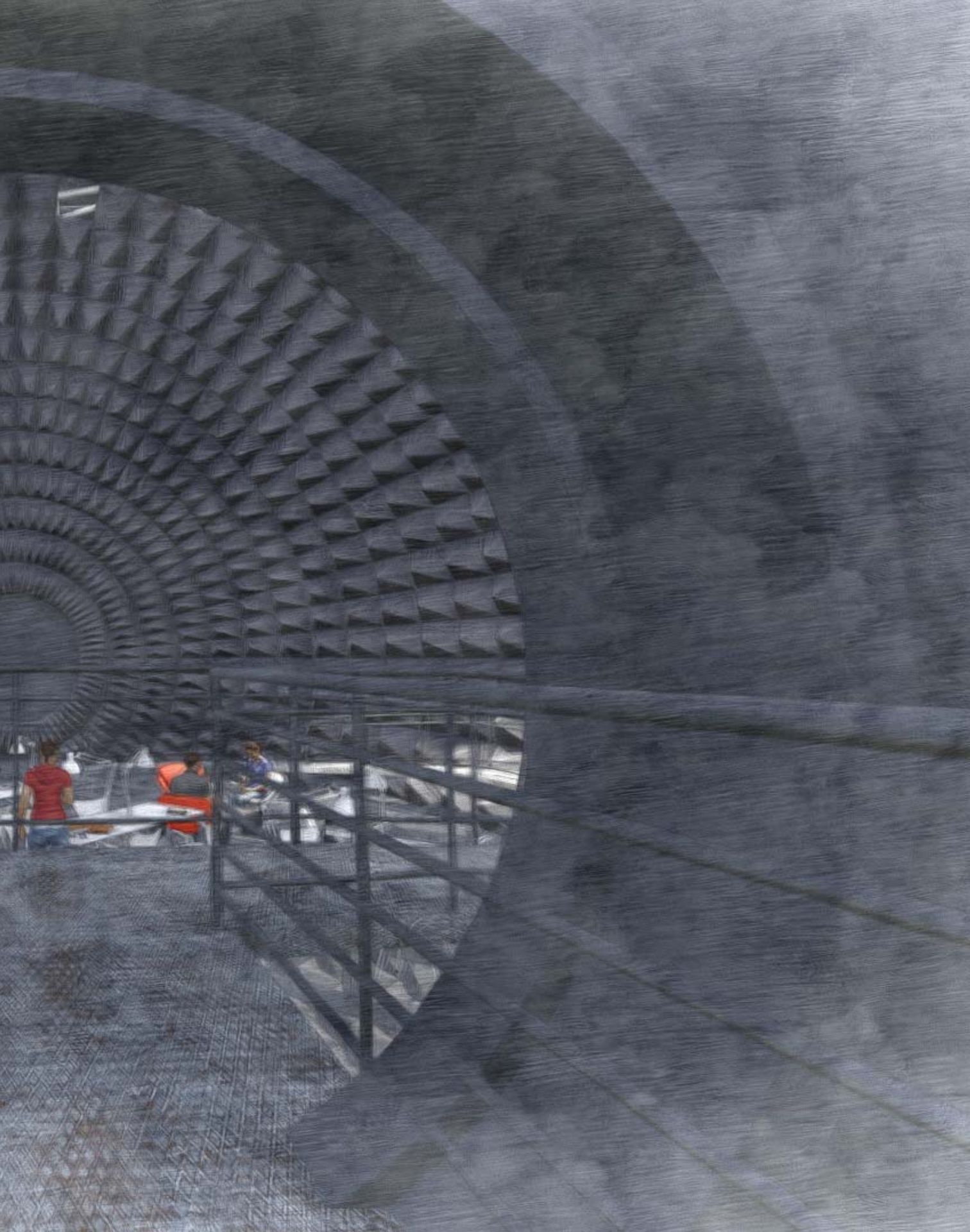


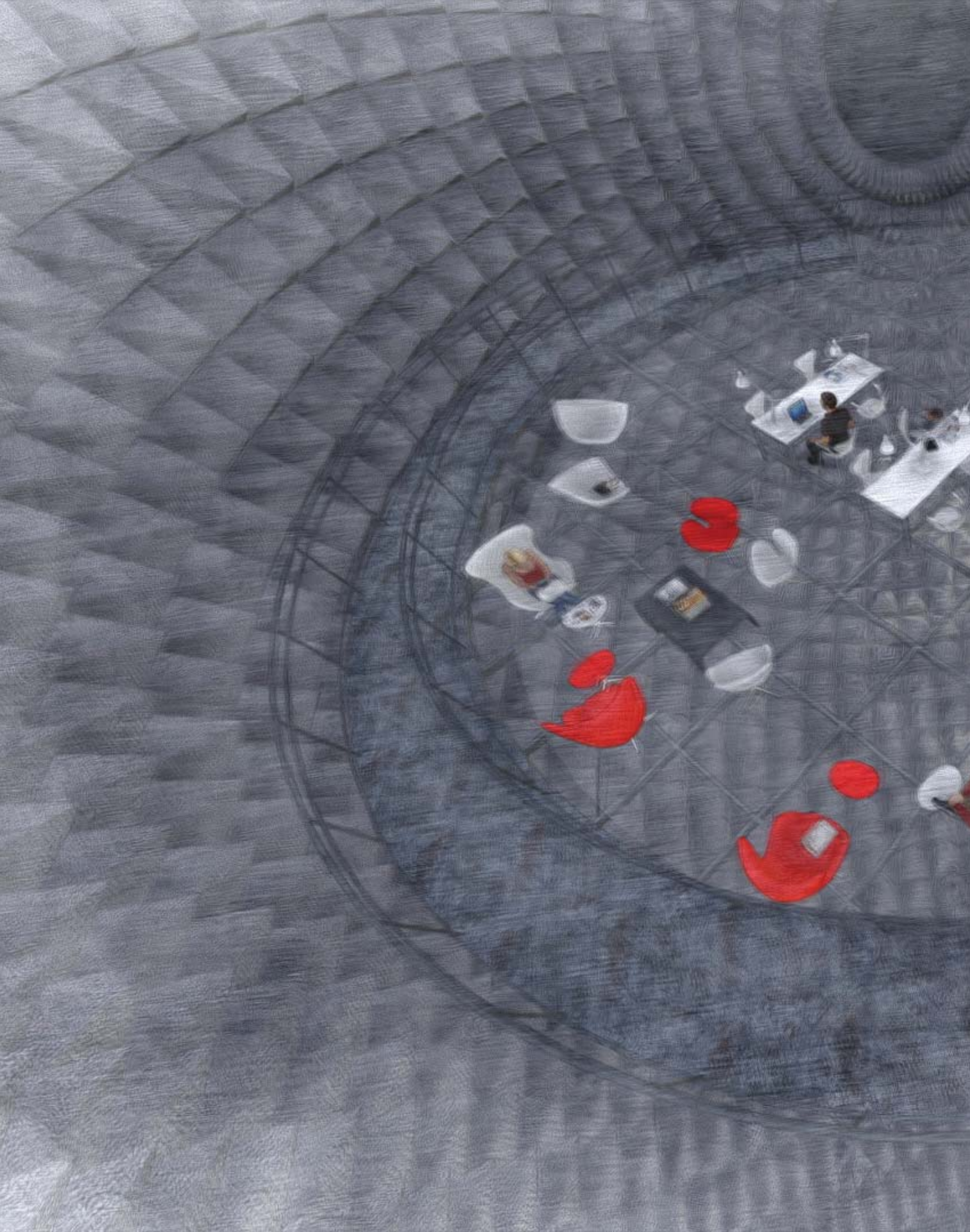


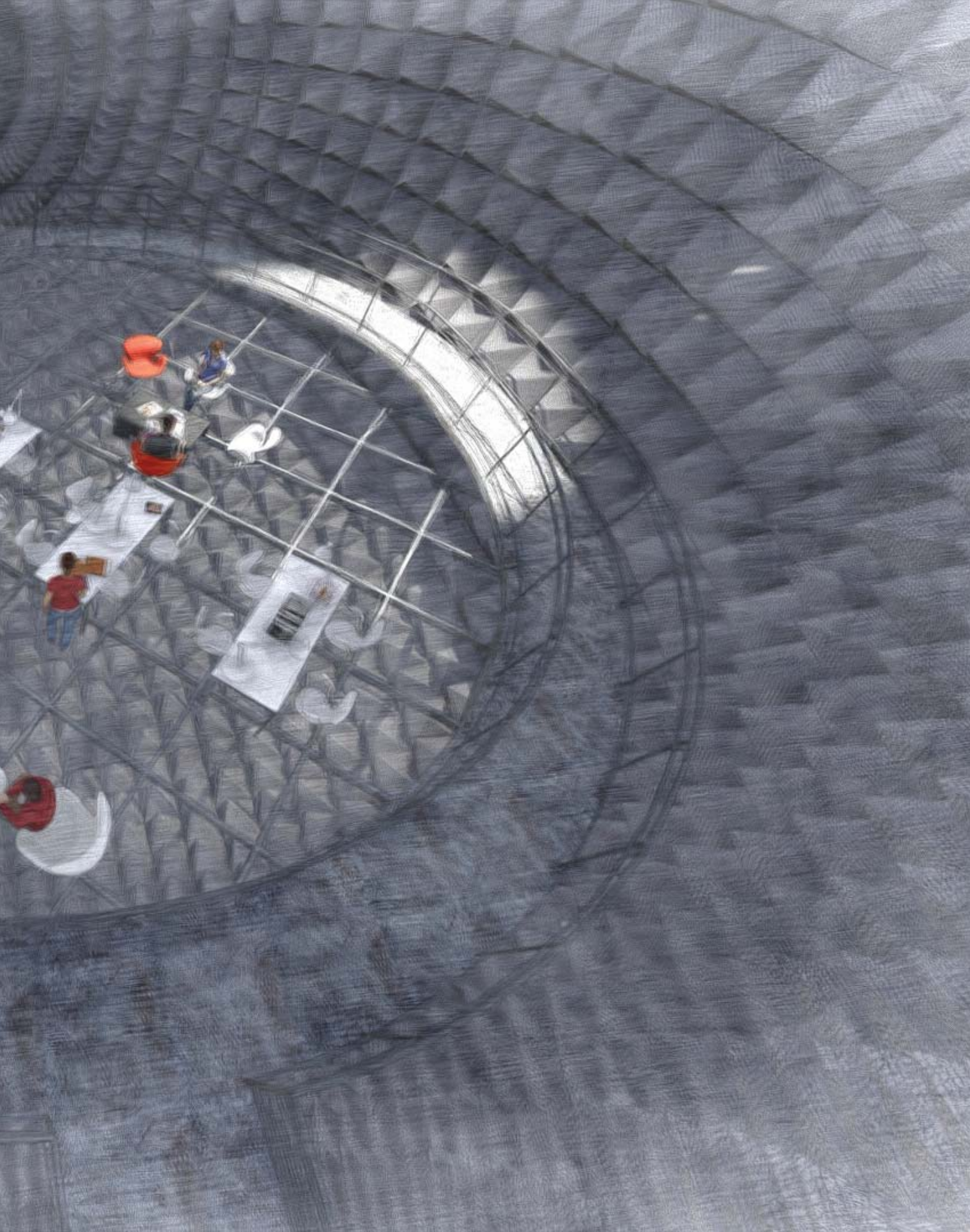












SOUNDSCAPES

For any of this to make sense, the “Sonic Model for an Urban Space” below must be watched and heard. Only then will one get a sense of sound’s ability to articulate space.

SONIC MODEL FOR AN URBAN SPACE

<https://vimeo.com/73831431>

Forget everything you know about space being physical, instead think of it as metaphysical, more: ontological - having to do with ‘being’. When sound reacts with tectonic form the result is an array of intersubjective conceptions of space, in the ontological sense. How does thunder outside make you act or feel? How does a serene and silent indoor space make you act or feel? How do your actions or feelings change when a strange or uneasy or out-of-place sound occurs? Architecture is the social substrate for spaces to be built upon and within, at the behest of the dynamic sonic environment.

The depth of field effect in this video is meant to frustrate your visual faculties, instead causing you to rely on your ears to determine your architectural surroundings. At certain points a still image occurs with a foreign sound to the original environment. These are attempts at causing you to formulate different ontological spaces within you mind or subconscious. How do you feel when they occur? Do they reconstitute the meaning of the building or cause it to become ambiguous? Sound is a very powerful tool that can be applied to architecture for the intentional design of spaces that are able to affect humanity at an existential level.

THE DIN OF URBANITY

<https://vimeo.com/70886035>

An initial sonic exploration.





ECHOLOGUE

THE REVERBERANT CONCLUSION

The impelling question posed at the beginning of this thesis simply will not go away. It is indeed a question that echoes and reverberates constantly within and between the spheres of overlapping human existences. It is a question that we subconsciously address every moment of our lives, whether walking, talking, working, eating or sleeping; all social and individual activities must inherently answer the question “what is space?” It also follows that the very nature and contour of these activities are shaped by sound. Recall that sound is the thing that determines the outcome of space, and therefore is an ingredient in how this question is resolved.

As explicated earlier in this work, architecture has a very critical role in defining the way in which this existential question is answered. It is the sounding board of the

aural environment such that it can affect spatial outcomes in the ontological sense. To reiterate, this means that architecture can change the way we exist — what we do, how we feel — because it interacts with sound and humanity simultaneously to produce intersubjective spatial ontologies. This is another way of saying that sound + architecture = behaviour. The resultant behaviour is then open to liquid and emergent possibilities based on a plethora of factors like personal upbringing, values, sensibilities, and the unpredictable dynamism of sound itself as it is sifted through them. In simple terms, this is a means of determining programmatic use; albeit in the *indeterminate* sense as it relates to emergence. The question “what is space” still remains a perpetual question, because the nature of ontological space is entirely

flexible and contingent on sono-formal interaction in architecture, and the individual and collective, that is, intersubjective, responses of humans to this interaction.

The term 'intersubjective' was a lynchpin for this work because it allowed space to be interpreted ontologically. In order to escape the dogmatic physical paradox of space as a type of non-object that yet has objective qualities, and to shift space into the metaphysical, it had to be framed as being subjectively determined. It was also observed that conceptions of ontological space could be unique *and* shared, meaning that they could not be considered primarily subjective, but having the ability to be wrought socially as well as individually in an interrelated or intersubjective way. For instance, in a noisy restaurant, there may be a common thread of space conceived which renders patrons comfortable, feeling part of the crowd and conversation. Conversely, a space may be conceived by others that causes them unease or detracts from their ability to relate in a certain way. Still others may have a different reading entirely, perhaps uncomfortable, but apt to socialize. More, if the restaurant becomes suddenly hushed, the types of spaces conceived change dramatically and therefore so do the appropriate usages and behaviours. The point is that sound is a powerful catalyst that can affect dynamic change in the

types of uses of architecture by shaping the intersubjective formulations of ontological space conceived by its inhabitants.

The term 'shape' was used in a twofold manner in this work. First, it was used as an alternative to the noun 'form'; a word which has its own set of architectural presumptions, but also is perhaps better used more commonly in written form as a general descriptor — as has just happened. The second usage of 'shape' was as a verb to suggest the creation or generation or 'shaping' of ontological space through the reaction of sound and form. This is how the title of this work came to be 'sound *shape* space', and as mentioned is its thesis hidden in plain sight. Using the word in this twofold way caused it to become somewhat ambiguous, perhaps in a similar way to the expedient misuse of the word 'space' that instigated some of the original critical impetus for this exploration. Semiotics aside, the true purpose of the 'shape' section of this work was to untangle the notion of physical or objective space and reposition it as an illusion. Having laid the groundwork of physical space as an illusory concept, the discussion could then move into space in metaphysical terms. Speaking of illusions and the metaphysical in the same breath is of course intellectually dangerous, but the section also points out a logical order, in that the illusory or imaginary can actually

reshape metaphysical understanding, as well as physical understanding to begin with. This was evidenced by bringing metaphors into the mix. The example of conceptualizing our visual field as a container was utilized to show how visual phenomena like parallax, when coupled with gravitational material arrangement, causes us to see things as being somehow “in” some form of spatial container. This illusion then fundamentally affects the way we think about space, as though it is physical in one sense, but then also applicable as a metaphor for understanding other metaphysical ideas as being containable, like political space, social space, cyberspace, etc.

Prior to these discussions though, the existential nature of sound and non-sound were developed. This really formed the basis for any existential discussion whatsoever, framing silence as the most tremendous of existential conundrums. Silence is where we approach a terrifying nothingness, or non-existence, and is also the point from which any sound can exist by nature of antithesis. Sound as a kind of point of entry into somethingness, or existence, moved the discussion into the prenatal condition where humans first come to be.

The acoustics of our foremost inhabited container, the womb, are very interesting. This is a place we collectively share, although not in physicality but in

spirit, so to speak. The reason it is so crucial is because it is the point when we first gain the sense of hearing some 20 weeks into gestation. The mother-child dialogue that takes place, although one-sided, is our first act of intent listening and non-listening, and more critically is the point when we first begin the development of the self. In this environment, sound is the first thing that contributes to affecting who we even *are* — effectively the seed for allowing the eventual intersubjectivity of the reading of ontological space.

Now, having climbed our way back out of the ideological quagmire that is this thesis paper, we are left with the echo of the original question, “what is space?” The intent now is not to leave off with some existential cliff-hanger, but rather to point out that this question is as intensely practical to architecture as it is poetic. This simple question has sparked an exploration that may never find its summit, but it has distilled some critical principles for the way that architecture must be pursued henceforth. To consciously pose this question constitutes a way of thinking and designing architecture that goes deeper than mere formal exercise. By asking “what is space?” as it is rendered in the context of this thesis, architecture can move beyond itself, to not only the building of the physical world, but to the way in which humanity exists within it. — SR

NOTES

1. INTRODUCTION

1. Le Corbusier, *Towards a New Architecture* (New York: Dover Publications, 1931), 29.

2. SOUND

1. R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1994), 254.
2. Blaise Pascal, *Pascal's Pensées* (New York, E.P. Dutton, 1958), 61.
3. Schafer, *The Soundscape*, p256.
4. John Cage, *Silence* (Middletown, CT: Wesleyan University Press, 1961), 8.
5. *Ibid.*, p.191
6. Daniel J. Levitin, *This is Your Brain on Music* (New York: Plume, 2007), 223.
7. *Ibid.*
8. Joshua Leeds, *The Power of Sound* (Rochester: Inner Traditions, 2010)
9. Peter Sloterdijk, *Bubbles: Spheres I* (Los Angeles: Semiotext(e), 2011), 501.
10. *Ibid.*, p. 503
11. *Ibid.*
12. *Ibid.*
13. *Ibid.*, p. 504
14. *Ibid.*, p. 507
15. *Ibid.*
16. Levitin, *This is Your Brain on Music*, 223-225.
17. Schafer, *The Soundscape*, p43.
18. *Ibid.*

3. SHAPE

1. William J. Eckoff, *Kant's Inaugural Dissertation of 1770* (New York: Columbia College, 1894). 65.
2. David Morris, *The Perception of Space* (Albany, NY: State University of New York Press, 2004), 1.
3. *Ibid.*, p. 21

4. SPACE

1. George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980), 5.
2. Ibid., p. 3
3. Lefebvre, *The Production of Space*, 15
4. Ibid., p. 34
5. Ibid.
6. Ibid., p. 33
7. Ibid., p. 38
8. Lakoff and Johnson, *Metaphors We Live By*, 30.
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11. Lefebvre, *The Production of Space*, 39
12. Juhani Pallasmaa, *The Eyes of the Skin* (Chichester: John Wiley & Sons Ltd, 2005), 49.
13. Katarzyna Krakowiak, *Making the Walls Quake...* (Venice: 13th Venice Biennale of Architecture, 2012), 3.
14. Julian Treasure, "Why architects need to use their ears." *TED* video, 1:05, September 2012. http://www.ted.com/talks/julian_treasure_why_architects_need_to_use_their_ears.html.

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