

THE
TEMPORAL
NATURE
OF
ARCHITECTURE

M. STOFKO

THE TEMPORAL NATURE OF ARCHITECTURE

by

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The Temporal Nature of Architecture

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Master of Architecture 2018

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Abstract

The desire for permanence that has been fundamental to architecture ignores the actuality of the physical world. The flow of time, linked to the process of articulation, is notably absent, resulting in an architecture that is misconstrued as static, passive, and deterministic. This conception of architecture is rooted in a conception of the world which has since been deemed obsolete.

Form exists as a transient manifestation of process. This temporal act of creation is perpetual, which depicts form as a momentary state in an object's continuous actualization. It has been said that process, rather than substance, is the prime constituent of the world. Architecture can be seen as a transient formation of tangible and intangible constituents that are understood as thermodynamic energy processes. Material formation, symbiotically linked to cultural transience, depicts an architecture with no absolute state, rather, it is constantly *becoming*.

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John Cirka,

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family and friends

To my family

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1

INTRODUCTION

*"No man ever steps in the same river twice, for it's not the same river and he's not the same man."*¹

From Heraclitus' infamous quote arise questions of life, the cosmos, physics, biology, philosophy, and, as this thesis posits, architecture as well. Heraclitus inclines us to contemplate the very nature of the world we inhabit, and the nature of ourselves. In both instances, the man and the river, he illustrates a world of eternal flux; a perpetual drive-forward through transitions;² a continual process of elaboration;³ a world always *becoming* ever-different.⁴ Heraclitus gave rise to notions of *time* as it relates to the form of nature, and with that, the core theme of this thesis has developed.

This thesis explores the implications of *time* in architecture. Not the *domesticated* time of clocks and calendars, but rather the thermodynamic time associated with creation, formation, degradation, and process. Architecture has long championed the idea of conquering time; great architecture is often associated with ideas of *timelessness*. The



desire for ideas and buildings to transcend history has instilled a pursuit of permanence into the profession that originates from its very origins in history. Architecture finds itself at odds with Heraclitus' idea of a world that is constantly changing. Many centuries later, his idea is instilled in modern physics, biology, sociology and other disciplines where the new conception of the world has adopted time and its implications on nature. Architecture, however, still seems to prefer to think of the world as frozen, immutable, and static, where the ideal laid down by the hand of the architect may persist; unchallenged and unaltered.

This thesis presents a different way of looking at architecture that is based off of the temporal conception of the world noted above. Architecture is seen as a *transient*

formation that, like all physical objects, is a system of matter and energy that incessantly transforms with the flows and processes that constitute its actuality. With this understanding of architecture's temporal nature, the thesis and its project herein intends to work towards a *temporal architecture* where a hopeless pursuit of permanence is no longer an underlying prerogative, but is instead inspired by the notion of a continuous *becoming*.

The work ahead is broken into 10 chapters, including this introduction. The following chapter, *Architecture's Resistance*, examines the lineage of architecture's relationship to notions of time, and looks at why ideas of permanence are so prevalent through history. The third chapter, *Time and Nature*, contains the bulk of information pertaining



to the new conception of the world where time is an inherent part of every physical thing; living or non-living. Next, the *Primacy of Process* presents an interlude where the new view of architecture favours time and process over static substance. Chapter 5, *Physics of Becoming*, goes deeper into the investigation of time in the world by exploring thermodynamics, the science that brought about the paradigm of a temporally conceived world. Chapter 6, *Principles of Temporal Architecture* distills the discussions on metaphysics, philosophy, evolution, biology and physics into ideas of how architecture can engage in time. Two principles for temporal architecture are put forward: *transience*, dealing with intangible aspects of culture, events, activity, and people; and *formation*,

which looks at the physical material aspects of architecture. Chapter 7, *Locus*, introduces the design project that acts as a vehicle for testing the principles. Chapters 8 and 9, *Transience* and *Formation* respectively, go further into the principles developed, and present architectural responses through the project. Finally, chapter 10, *Towards a Temporal Architecture* is a conclusive look at the project developed and its relation to the central thesis.

NOTES

- 1 Plato, *Cratylus*, n.d., 402a.
- 2 Henri Bergson, *The Creative Mind: An Introduction to Metaphysics* (Dover Publications, 1946), 15.
- 3 Charles Sherover, *The Human Experience of Time: The Development of Its Philosophic Meaning* (Northwestern University Press, 1975), 174.
- 4 Sanford Kwinter, *Architectures of Time: Toward a Theory of the Event in Modernist Culture* (The MIT Press, 2002).



Figure 2 *The Architect's Dream*, 1840, Thomas Cole

2

ARCHITECTURE'S RESISTANCE

When any discourse on time isn't outright absent, it is often viewed in a negative light. Time is something to be conquered, domesticated and expelled in the pursuit of timelessness. We champion the resistance of time that is represented in our stone monuments, or megastructures of concrete. The desire for permanence had since become a fundamental aspect of architecture. With all of this, any serious discourse on time had seldom taken place in architectural history. In western civilization, there is, however, a lineage of thinkers who have engaged in questions of time. Often associated with mankind's existential questions of its existence, the cosmos, and nature, time had been discussed by classical thinkers such as Aristotle, who said time is a mark of change;¹ Plato, who viewed time as the principle of order in the universe that binds everything together;² and Heraclitus, with his famous "never step in the same river twice" analogy.³ Time was largely a metaphysical concern for philosophers, though it wasn't until the 17th century when questions of time were considered in mathematics and science.⁴

Rene Descartes sought to understand nature through mathematical reasoning, viewing time as a sequence of independent moments, all drawn together to form time;⁵ Isaac Newton viewed time as absolute and utilized his notion of time as a constant for Newtonian physics.⁶ Leibniz disagreed, arguing that time has no independence from entities, but is rather a system of relationships that binds things together in a “mutuality of development.”⁷ Time had been adopted by physics with Newton, and furthered by thermodynamics, and transformed by Albert Einstein. Temporal discourse is also present in biology, ecology, sociology, and other fields. Time is understood to be an inherent part of the world, and is studied as such. Despite all of this, architects still largely possess a desire for timelessness. Architecture still rests on the foundations of permanence on which it was built.

2.1 Absence

The absence of temporal discourse in architecture can be attributed to architecture’s fundamental role through history as a shelter to domesticate space and to escape the effects of time and nature.⁸ Humans’ desire to separate themselves from nature brought about this domestication of space and escape from time. This is evident in the origins of architecture and dwelling. Our desire for



Figure 3 [above] *Vitruvian Primitive Hut*, 1755, Charles Eisen

separation from nature continued to manifest itself through the Paleolithic period into classical architecture. The Vitruvian triad of concepts that defined architecture, *firmitas*, *utilitas*, and *venustas*, held architecture's resistance to time as one of its fundamental characteristics.⁹ Architecture, at its very essence, was thought to go against the effects of time. Many great ancient works of architecture did, in fact, persist through history. Perhaps it was through architecture that mankind could assert itself as the species above nature in its conquering of time. The Great Pyramids of Egypt exist today as a monument to the greatness of the ancient Egyptian civilization. Even thousands of years ago, humans had begun to conquer and defy time on a grand scale. Humans have become so effective at defying the effects of time in the structures we build that the 'terror of time' has been virtually eliminated.

2.2 Domestication

Humanity's desire to separate itself from nature, and to control it, can be traced back to humans learning how to create and control fire. It was around the fire pit that human beings developed social behavior and primitive forms of language. It is widely accepted that agriculture brought about the beginnings of modern civilization, however it was the much earlier advent of human controlled fire that

marks the beginning of the ideological split between man and nature.

Time, memory and dwelling were linked in the treatment of the dead in primitive civilizations. Amid "the uneasy wanderings of Paleolithic man, the dead were the first to have a permanent dwelling: a cave, a mound marked by a cairn, a collective barrow."¹⁰ It appears as though ancient people desired to extend the memory of the perished beyond their natural end. Here we see memory as a method of defying the realities of time. It was through fire and memory that mankind had begun to defy nature.

In his article *Building and the Terror of Time*, Karsten Harries talks about human beings' desire for control over their environment as "not just a matter of creating an artificial environment that offers protection against an unfriendly world; as important as physical control is psychological control."¹¹ This psychological control, he continues, is in creating paradise where "man was at home and knew his place."¹² Architecture, then, provides not only a physical shelter but establishes the impression of true inhabitance – that we belong. If it is in buildings where we humans feel at home, then the outside wilderness is a territory that is to be escaped. Man and nature are thus theoretically separated.

Harries describes the desire to separate one's self from nature as a means to ignore the ultimate implication of time, being one's own

mortality.¹³ The physical and psychological shelter that is fundamental to architecture banishes feelings of vulnerability and mortality with its association with memories of protection.¹⁴ “We live fixations of happiness. What is recalled is thus not simply the past, but an idealized past over which time has no power and which so fuses with the present that it redeems it, too, from the tyranny of time.”¹⁵ With this idealized fixation that Harries describes, architecture allows us to ignore the inevitability of time and mortality that is so characteristic of nature. Perhaps for this reason we prefer to think of ourselves as separated from nature, and thus, from the effects of time.

This ideological separation continues to this day. We live in towns and cities where fear of the effects of time has been all but eliminated. Michael Weinstock speaks of how we are accustomed to think of nature and man as separated, that “man is different, set apart from the wild, with a life that is ordered by culture and technology.”¹⁶ We have become so proficient at escaping the dangers of nature that the flow of time has virtually escaped our consciousness. The implications of time have thus escaped our minds; humans, comparatively, live safer, more comfortable lives where eventual mortality is not implied in the built world around us. The expulsion of time has undeniably made life better for the human race.

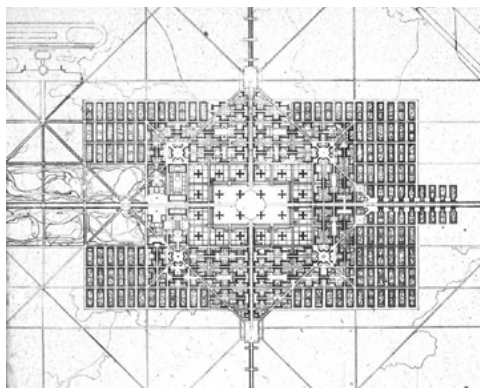
2.3 Expulsion

The resistance of time in architecture is rooted in its very foundations where “the classical definition of architecture is based on the triad of Vitruvian concepts *utilitas*, *firmitas*, *venustas*.”¹⁷ The three concepts can be summarized as function, stability and beauty, respectively. *Firmitas*, in particular, describes permanence: the capacity to stand up against the passage of time.¹⁸ With the idea of *firmitas*, time has been seen as the antithesis of architecture through history, and continued into modernism and persists today. Jeremy Till writes that architecture engages in a conflict with time to remove the element of flux and uncertainty; a battle that is futile, but fought nonetheless.¹⁹ Architects seek to build up a defense against the “terror of time”.²⁰ Till notes that this is done in a few ways: to deny time’s existence, to express architecture’s fundamental goal of approaching timelessness, and third, to accept that time exists, but to “erect physical barriers to halt the flow through recourse to [*firmitas*].”²¹ These three strategies underlined the expulsion of time that, according to Henri Lefebvre, is “arguably one of the hallmarks of modernity.”²² The early modernists sought out the eternal truths of architecture in an effort to approach architecture that could transcend time;²³ timelessness in the ideal. With eternal

Figure 4 [top] *The Discovery of Fire in Cesariano's Vitruvius*, 1521, Cesariano <https://originsofarchitecture.files.wordpress.com/2012/11/cesariano-fire.jpg>

Figure 5 [middle] *The Fall of Man*, 1629, Peter Paul Rubens [https://en.wikipedia.org/wiki/The_Fall_of_Man_\(Rubens\)#/media/File:Peter_Paul_Rubens_004.jpg](https://en.wikipedia.org/wiki/The_Fall_of_Man_(Rubens)#/media/File:Peter_Paul_Rubens_004.jpg)

Figure 6 [bottom] *Ville Contemporaine*, 1922, Le Corbusier http://www.mediaarchitecture.at/architekturtheorie/le_corbusier/content/jss_042402_corbusier_010_contemporary_city_1922.jpg



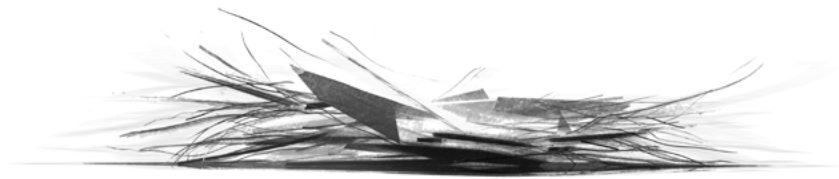
truths, it was seen that architecture could provide the ultimate solution to humanity, across all of time.²⁴ Modernist projects such as Ville Contemporaine by Le Corbusier in 1922 contains an underlying idea of *firmitas*, that is, he is presenting an architecture that is situated beyond time and uncertainty. Furthermore, the project evokes a cultural firmness that depicts this vision as the ultimate, eternal way of life. It is almost as if all social and intellectual development through history had resulted in this, the final form of humanity. What is more, any tracings of progress or history are wiped out in this proposal, all replaced by the new. In Ville Contemporaine, there is no future, nor a past.

2.4 Permanence

The fear of time that had previously been dominant in Paleolithic mankind has long since been eradicated. We have mastered the ability to create shelter and comfort for ourselves and, consequently, removed the realities of time from our concern. The founding principles of architecture – which we still look towards even today – made the conquering of time, through a pursuit of permanence, a fundamental aspect of architecture. Mankind had left its mark on the world through built works and thus was projected ‘above’ the realities of nature. Man and nature were separated.

Through our history of resisting and rejecting time we have become so proficient at it that we have gotten to a point where time has almost slipped away from the consciousness of architects. With the absence of time, architecture is misconstrued as static and permanent. While we may no longer fear time, we are not exempt from its effects. Architecture is certainly no exception to this; stasis and permanence are *physical impossibilities*. This is not a ground-breaking revelation; *of course* architecture isn’t permanent. Architecture is a formation of matter and energy in space and time which is subject to change and interaction in multiple spatial and temporal scales. It is *inherently* temporal. A presumption of stasis and permanence means that architects aren’t even considering – let alone designing for – that inherent aspect of buildings. When such a fundamental consideration is absent, how can we as architects sufficiently engage in architecture? Our understanding of architecture, the world it inhabits, and its interaction requires a serious discussion of its temporal nature.

Figure 7 [opposite] Design research model: *Life of the Building*, by author
In the physical model, duration is represented from left to right, so the length of the model is a timescale. The model is representative of the matter and energy that make up the life of the building. From the left to right, matter is taken from its previous state and context, and is eventually brought together into an architectural formation. It continues, to the right, through the life of the building, where it is eventually dispersed in the distant future. The model aims to demonstrate how a broader understanding of architecture can be achieved by considering aspects beyond the finished instant. It communicates how architecture is but a transitory state for the matter and energy that it encompasses.



NOTES

- 1 Sherover, *The Human Experience of Time: The Development of Its Philosophic Meaning*, 15.
- 2 Ibid.
- 3 Plato, *Cratylus*, 402a.
- 4 Sherover, *The Human Experience of Time: The Development of Its Philosophic Meaning*, 97.
- 5 Ibid.
- 6 Ibid., 100.
- 7 Ibid., 105.
- 8 Karsten Harries, "Buildings and the Terror of Time," *Perspecta: The Yale Architectural Journal* 19 (1982): 60.
- 9 Ignasi Sola-Morales, "Liquid Architecture," *Anyhow*, 1997, 36.
- 10 Leland Roth and Amanda Roth Clark, *Understanding Architecture*, 3rd ed. (Westview Press, 2013), 159.
- 11 Harries, "Buildings and the Terror of Time," 59.
- 12 Ibid.
- 13 Ibid., 60.
- 14 Ibid., 61.
- 15 Ibid.
- 16 Michael Weinstock, *The Architecture of Emergence: The Evolution of Form in Nature and Civilisation* (Wiley, 2010), 11.
- 17 Sola-Morales, "Liquid Architecture," 36.
- 18 Ibid.
- 19 Jeremy Till, *Architecture Depends* (The MIT Press, 2009), 79.
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- 21 Till, *Architecture Depends*, 79.

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24 Sola-Morales, "Liquid Architecture," 36.

3

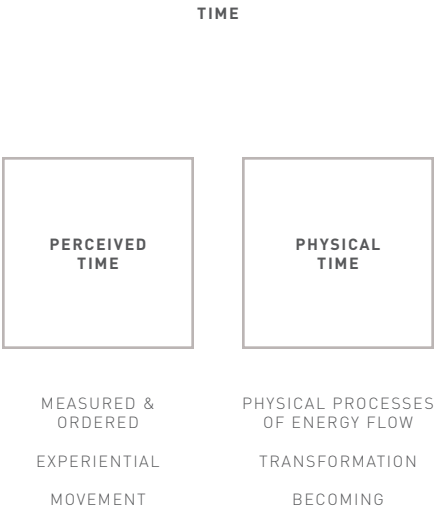
TIME & NATURE

*"we are accustomed to thinking of [architecture] exclusively in terms of physical, mute, immutable objects... concerned solely with material forms, cold and intangible, situated beyond time."*¹

3.1 Time as Process

To understand architecture's relationship with time we must first examine and define time itself. As St. Augustine infamously proclaimed, "What then is time? I know what it is if no one asks me what it is; but if I want to explain it to someone who has asked me, I find that I do not know."² It is difficult to explain yet we all know what time is. We all understand seconds, minutes, hours and days. But is that time? Or is that just an ordering of time? If so, what is time, itself, which we are measuring? For this thesis, time will be referred to as two binary concepts: *perceived time* and *physical time*.

Time, as we typically understand it, can be described as the human measurement of movement and change in space. This view of time exists within the human mind as a



means of ordering our experiences. It can be commonly understood as the measuring of celestial bodies in outer space.³ The earth rotating around the sun gives us a year; its rotation about its axis gives us a day, a day is divided into twenty-four hours, and so on. This conception of time is manifested in the clock. With the clock, time has become ordered, finding use in science and mathematics. Furthermore, it is often treated as a constant – time flows at a constant rate that perpetuates for all eternity. In this sense, it is defined by a human perception of movement; primacy is given to the human experience. This definition of time will be referred to as *perceived time*. These measurements of spatial movement are what we order our lives around; perceived time is our reality.

Investigating *perceived time* in architecture tells us more about how we, as inhabitants of architecture, experience time *through* buildings. It does not necessarily inform us about the nature of architecture, nor how buildings themselves are affected by the flow of time. At this juncture, we can set aside perceived time and look towards *physical time*. This goes back to St. Augustine's question: "what then is time?"⁴ If what we typically understand to be time is the human perception and understanding of movement, then what is driving the changing universe forward through its continuum? Hegel states that "All that we can directly perceive is not time as such –

which is abstract and ideal – but Becoming... the form of rational change."⁵ Perceived time may be our experienced reality, but Hegel's *becoming* is the real process that constitutes the world's continuously changing existence. The actual change and motion inherent to physical objects that Hegel is discussing will be referred to as *physical time*. Physical time does not exist in and of itself, but rather refers to physical *process* – the flow of matter and energy in the world. Time, in this sense, is linked to physical processes that account for an object's perpetual transformation.

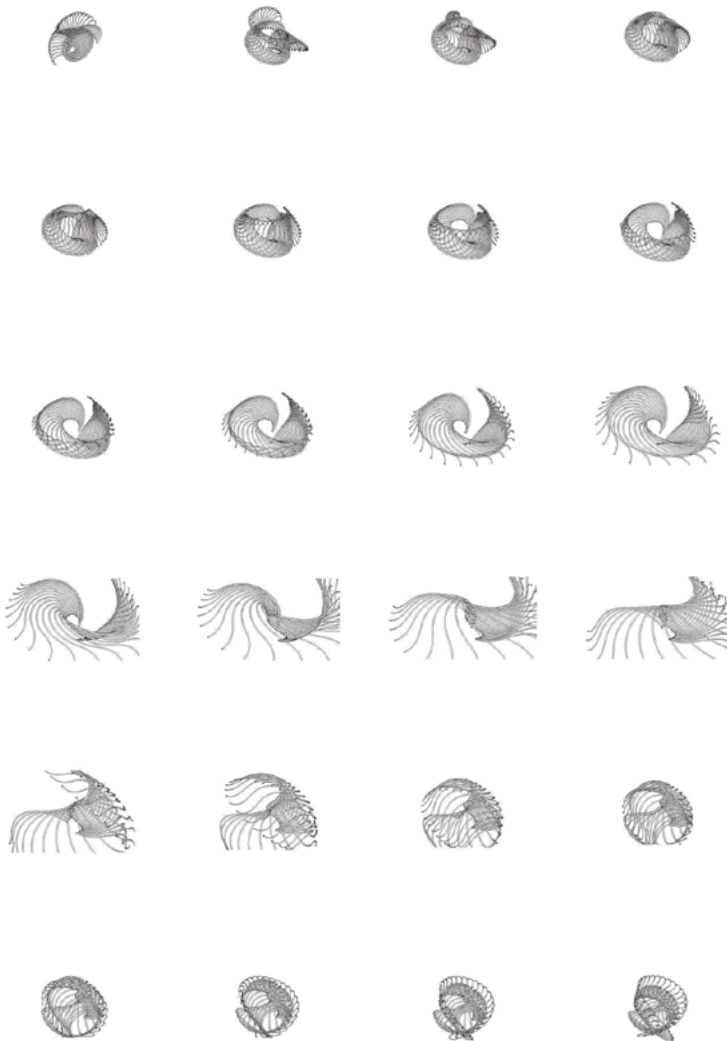
Physical time, unlike a traditional view of time and presence, is not a medium in which real objects simultaneously exist. Through history there have been many discussions on the nature of time from Aristotle to Einstein. Contemporary physics links time and space into a single medium, *spacetime*.⁶ *Physical time* is a localized process inherent to objects that drives forward their individualized *becoming-ever-different*.⁷ As a localized event, this conception of time has a temporal magnitude which not only varies between localities, but is also dynamic itself. The *tempo* of *physical time* is the speed at which the processes of matter and energy flow occur. Luis Fernandez-Galiano distinguishes this conception of time (which he calls *becoming*) from a traditional notion of time: "Today it is widely accepted that astronomical time, the time of clocks, is essentially different from the

time we associate with biological or cultural becoming. The latter, unlike Newtonian time which flows uniformly, flows with the rhythm of processes and the speed of events, in the same way that it stops if these come to a halt.”⁸

This new conception of time linked to process raises an ontological consideration of the object. Objects are collections of matter that experience a constant variation.⁹ This view of the object is tied to the *event*¹⁰ – a specific moment in a continuous process – bringing physical time into the notion of the object. Deleuze argues that “[the object is] no longer defined by an essential form. He calls this idea an object/event, [or] an *objectile*. [The objectile] is no longer concerned with the framing of space, but rather a temporal modulation that implies a continual variation of matter.”¹¹ The objectile concept is intended to question the way we see the world, and for this thesis, the way we look at architecture. The concept begs us to look at physical form not as an absolute truth, but as a temporal cross-section of an objectile’s perpetual process of becoming. With this notion, the ideal of a final, absolute form is questioned. As Henri Bergson wrote, “what is real is the continual change of form: form is only a snapshot view of a transition.”¹² The inclusion of physical time into our thinking of objects transforms our conception of the physical world.

3.2 Constituents of Nature

The absence of physical time from architecture is an indication of ignorance of the make-up of the physical world. A misunderstanding of the nature of the world that we intend for our architecture to inhabit signifies a misunderstanding of architecture itself. Physical time is an inherent aspect of the universe; without processes of energy and matter flow, there is no life, no movement, no activity. The physical universe can be described as being composed of four essential constituents: *matter*, *energy*, *space* and *physical time*.¹³ It should be noted that this is an oversimplification of our contemporary scientific understanding of the universe. However, it is a sufficient basis that we can apply to architecture. Architecture exists in a scale that physicists refer to as the *intermediate dimension* – the scale that is observable to humans on a daily basis – in-between the micro scale of quantum mechanics and the macro scale of general relativity. In the intermediate dimension, matter and energy can be epistemologically identified as separate concepts, but, as we will discuss, none of these four constituents can be understood as independent.



3.2.1 Matter & Space

We have already linked physical time to processes in the world. These processes are realized through the flows of energy and *matter*. Matter, the substance of things, is easily understood to us – we can directly observe it. The material forms that we interact with – and are, ourselves – are collections of matter held together in an organized state of order. Matter is the domain of architects. It is the prime area which architects have agency over: the arrangement of material into an assembly is how architects concretize design. Matter may be the domain of architects, but it is often reduced to a thinking of form and geometry. Geometric forms are often rationalized with material; matter ends up in the service of an idealized form. Kiel Moe argues for an inverted approach, where we can “shift from [thinking of] geometry as an abstract regulator of the materials of construction into a notion that matter and material behaviors must be implicated in geometry itself.”¹⁴ When matter is not implicated in design, architecture becomes detached from materiality, and therefore, actuality. Immaterial forms carry the implication of being “cold and intangible”¹⁵ where the physical make-up is concealed in favour of formal purity.

Matter cannot be engaged in isolation from the three other aspects of nature.



Figure 10 [above] *Constituents of Nature*, by author

When architects consider the substance of architecture without looking at energy and time, the dynamics of matter are seldom present. Thinking about matter coupled with physical time is a more accurate way of engaging the actuality of architectural form. To echo a previous notion, time brings the idea of process into the discussion. Process is implicit in matter, though not always expressed.

Space, in addition to matter, is the second constituent of nature that architecture considers. Space may not be the prime domain of architects in the way that matter is – space is largely consequential of matter, and is not as directly influenced by the hand of the architect in the way that matter is. Space, after all, is not a tangible thing that we can touch or see directly. We understand the distance between objects as being spatial, as well as the volume objects occupy, or volume within rooms. Through matter we understand space. Space, according to Elizabeth Grosz, is “discontinuous, infinitely divisible, static, an always actual. Space, in short, is the milieu of things, matter, identities, substances, entities that are real, comparable, and calculable. It is the natural home of science, of the actual, where there are differentiations of degree but not in kind.”¹⁶ To put it quite simply, Space is the medium in which substance exists.

Through the abstract measuring of matter, space has become domesticated at the service

of geometry. Euclidian space is a human ordering of space – not unlike the time of clocks being a human ordering of physical time. Just as the time of clocks has dominated the human interpretation of time, Euclidean space has dominated the human interpretation of space. In both cases, the subject is abstracted and stripped of its dynamic qualities and implications in the physical world. With Euclidean space dominating architectural drawings and imagery, the temporal qualities of the representation are often absent. The physical matter depicted, to echo the previous discussion, is reduced to immutable, permanent form. When time is stripped from depictions of matter, what is also lost are the transient atmospheric qualities, such as the passing of light and sound, the experience of movement, the weather, or feelings of transience.

With the rise of perspectival drawings during the renaissance, and its continued dominance in architectural representation to this day, space and matter had been solidified as the prime concerns of architecture. Depicted in drawings are buildings as static, ideal objects which are situated in a dream-like state of perfection. The real implications of matter and space (not to mention energy, and time) are replaced with a mere instantaneous cross section of actuality. Bruno Latour notes that “it seems almost impossible to grasp [buildings] as movement, as flight, as a series



of transformations.”¹⁷ Perspectival drawings ensure that matter and space cannot be depicted as a ‘flight’. Process is expelled in favour of form. Latour continues, stating that perspective drawings are responsible for the viewing of buildings as static¹⁸ and, most crucially, that Euclidean space reduces materiality to objectivity.¹⁹ He challenges architects with the task of capturing the “‘thingly’ nature of buildings, by contrast to their tired, old ‘objective’ nature.”²⁰

3.2.3 Matter & Energy

The notions of matter and space that define the discipline of architecture clearly do not do justice to the complex reality of nature. Our abstracted idea of space essentially freezes matter into geometry. In actuality, matter cannot be described without energy. Matter is, as Kiel Moe argues, but captured energy.²¹ The two constituents, while understood differently, cannot be isolated from one another. “Any physical thing – a building, landscape, or body, for instance – is a set of vibrating molecular lattices; an accumulation of processes that eventuate in a form that maintains an organization for a certain duration.”²² He continues to say that these lattices are held together through energetic bonds²³ – captured energy maintains material form. The energy that holds together matter is intrinsically dynamic. Energy can be exchanged or

transformed, resulting in changes to the material. Matter, in this sense, is *inherently temporal*. It is never isolated from energy, never not moving, never permanent. The flow of energy is responsible for process and the creation of form. Architects can gain a better understanding of the material substance they have agency over through an engagement with time and energy.

Energy is very complex as it takes on many forms – obviously it is not restricted to the energy that binds particles together. Jennifer Coopersmith writes:

“What is energy? [There are] various forms of energy: the motion energy of a cricket ball, the energy stored in food, a battery, the binding energy of nuclei, the bond energy of chemicals, heat, the energy of a flowing river or a trade wind, the energy transported by electromagnetic waves, the stress energy in a loaded beam or in the gravitational field, the energy stored in a dam or a millpond, the energy in steam, the energy stored in a capacitor, the energy required to move a magnet in a magnetic field, or electrons round a circuit, the energy in a flywheel, or raised weights, or a squashed/stretched spring, the rest mass of fundamental particles, the energy used by a light bulb in an hour, the energy implied by a certain curvature of spacetime, and so on—and modern examples, such as the energy of the Higgs boson or of a rotating

black hole. Upon careful examination, all these various forms fall into just two main types of energy: kinetic, the energy of motion; and potential, the energy of interaction of parts of a system."²⁴

There are indeed numerous forms energy can take, which interact and exist through dynamic energy exchanges. The substance of buildings clearly cannot be understood without the inclusion of energy. Energy in the form of electricity, heat, or light, for example, has been prevalent in building science aspects of architecture, but what this thesis is most interested in is the energy embedded in material that makes the material a temporal entity. This view of energy in architecture is correlated to the process at the point where matter comes into form; energy and process are the true creative forces in nature. "There is no transformation, irreversible change, or mutation without energy; without it there is neither construction nor destruction, neither animation nor time."²⁵ The movement and flow of energy, as we will discuss in the next few sections, drives change in the world. Without it, there is no life, no form, no activity, no creation, no destruction. All matter, Kiel Moe says, is "an expression of the energetic exchanges between molecular lattices and their milieu."²⁶ Matter can then be seen as a representation of energy; A diagram of process.²⁷ As Whitehead proclaimed,

"process, rather than substance, is the primary constituent of the world."²⁸

3.3 Temporal World

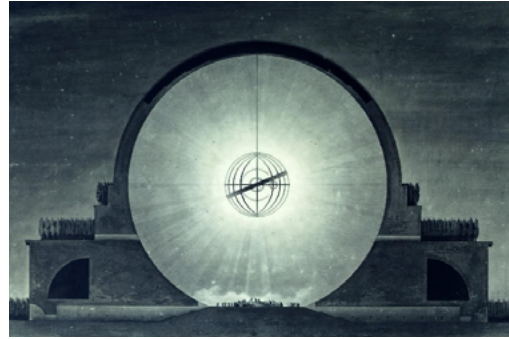
Indeed, the universe consists of matter, energy, space and physical time. There is no physical form without the phenomenon of change; physical time is inherent to everything that exists. This may not be apparent in the world we observe day to day. From this very text you read to the building you are in, the landscape on which that building sits, to the planet and all the stars in the galaxy... it all appears to be relatively static: a fixed, deterministic setting within which life happens; a setting that will continue to persist long after life perishes. This static conception of the world is rooted in western science²⁹ that has for centuries viewed nature as simplified and absolute.³⁰ Ilya Prigogine draws a distinction in the progression of physics between that of the static world, which he refers to as the *physics of being*, and contrasts that with a more contemporary understanding of the universe as dynamic and chaotic: the *physics of becoming*.

The physics of being is a resultant of a classical understanding of the world that emerged in western philosophy and science. This form of physics was dominated by Isaac Newton's work which remained virtually unquestioned though the age of enlightenment and into the



nineteenth century.^{31 32} This ‘physics of being’ – or *mechanicism*³³ as it has also been labelled – can be characterized as deterministic and timeless. Etienne Louis Boullées’ cenotaph for Newton **[Figure 13]** embodies the world conception of the physics of being with its Platonic solids, implications of permanence, and immaterial surfaces. The architecture of mechanicism is clearly resultant from its Vitruvian foundations of firmitas.

Mankind’s understanding of the nature of the universe had been assumed to be largely complete by the end of the nineteenth century. Ilya Prigogine noted that “this static view was almost unanimously accepted by the scientific community. But we have since been moving away from it. A dynamical view in which time plays an essential role prevails in nearly all fields of science now. The concept of evolution seems to be central to our understanding of the physical universe.”³⁴ The fields of physics, biology and sociology had all simultaneously begun to adopt this dynamic conception that challenged the existing mechanistic paradigm. In physics, this shift was brought about by the introduction of thermodynamics – the science of energy transfer – and more specifically its second law of increasing entropy³⁵ [discussed further in chapter 4. *Thermodynamics*]. As Fernandez-Galiano discusses, entropy “would give rise to a conception of the world that was markedly different from, and in many ways incompatible with, that of Newtonian



mechanicism.”³⁶ Here we see the rise of Prigogine’s *physics of becoming*.

With thermodynamics, the nature of the world was no longer seen as orderly, timeless and immutable. “The Entropy Law [superseded] Newtonian mechanics as the ruling paradigm of science because it, and only it, adequately explains the nature of change, its direction, and the interconnectedness of all things within the change process.”³⁷ This contemporary outlook views time in a different way than the physics of being had done; it was understood in the *biological* sense of an object’s (objectile’s) becoming.³⁸ This biologically inspired notion of time aligns with the concept of *physical time* described previously; the time of matter and energy processes seen in thermodynamics. With the physics of becoming, it is understood that “[physical time] means invention, creation of forms, continuous elaboration of the absolutely new.”³⁹ Physical time is not the resultant flows of energy that occur in forms, but rather it is form that is resultant

Figure 13 [above] *Centograph for Newton, 1784*, Etienne-Louis Boullée <https://i0.wp.com/www.thethinkersgarden.com/wp-content/uploads/2015/07/Etienne-Louis-Boull%C3%A9s-design-for-the-Cenotaph-for-Newton.-Section-at-night-with-interior-day-effect.-Image-%C2%A9-Biblioth%C3%A8que-Nationale-de-France.jpg>

of the flows of energy. Physical time, in contemporary physics, is the creative engine of forms.⁴⁰ In this sense, formations in the universe are never static, but always *becoming*. They continuously experience flows of energy and matter exchanges and, therefore, are continuously changing. Nature has no fixed state.

The flows of energy and matter that constitute physical time can be observed as local phenomena as opposed to the universal constant of measured perceived time. As such, the physical process of energy transformation varies from form to form at multiple speeds, while also slowing down and speeding up as the process progresses. The speed of physical time in an object will be referred to as its *tempo*. This evokes Michael Serres' and Kiel Moe's discussions of *temps* which are described as "time, [being] inextricable from the vortex of swirling energy and matter that drives nearly all earthly processes. The *temps* [refers to] the rhythmic cycling of the megapulsing of energy over very short *and* very long periods and paradigms."⁴¹ Time, space, energy, and matter are all linked with *tempo* according to the magnitude of process.

With discussions of localized tempo, nature having no fixed state, and the creative agency of physical time, we can turn to a concept that captures the temporal nature of the universe. It informs us of the imperative of including physical time and energy into our conception

of the (previously assumed static) universe.

3.4 Form Follows Flow

This dynamic, ever-changing conception of nature is most clearly observable in fast tempo processes of living things. The concept of *form follows flow* is argued to be a primary driving force of how nature has evolved over history. Wentworth D'Arcy Thompson "regarded the material forms of living things as a diagram of the forces that have acted on them"⁴² while, similarly, Alfred North Whitehead states that "nature consists of the patterns of activity interacting with each other."⁴³ The ecology of the world is understood to be dynamic and ever evolving where the forms of living organisms are manifestations of their contextual flows of energy and interaction. In other words, no form is in isolation; natural forms evoke a virtually pure efficiency of receiving energy for the purpose of survival. Form follows flow, in this sense, can be seen as a specific variant of *form follows function*. This ultra-efficiency of nature can be observed in trees: "Spatial programs may be regarded as transformers of matter, such as green leaves converting sunlight and carbon dioxide into sugar and water, rather than simply positioning buildings as geometric obstacles in a landscape around which living things are compelled to move."⁴⁴ The form of the leaf is dictated by the flow of energy from the sun, and its function of

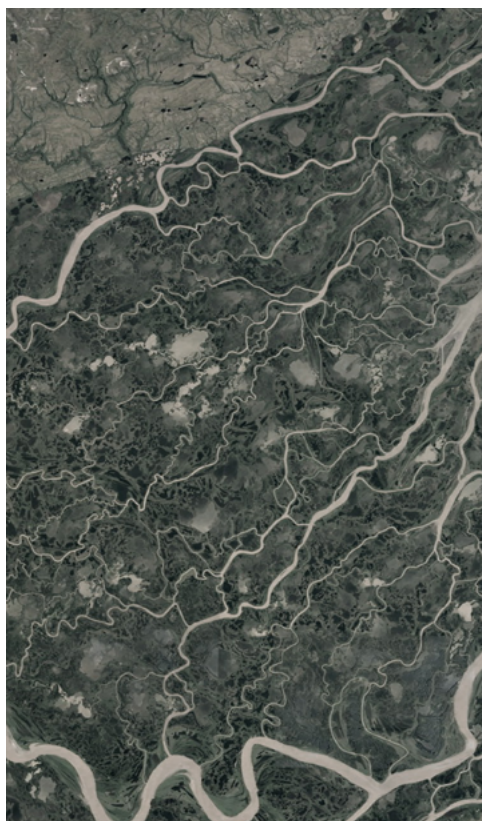


Figure 14 [above] *The Mackenzie Delta*, Google Maps <https://www.google.ca/maps/@68.4271114,-134.8103639,78981m/data=!3m1!1e3>



Figure 15 [above] *Slot Eroded Canyon*, <http://www.lovethepics.com/wp-content/uploads/2011/06/HDR-Antelope-Canyon.jpg>

generating nutrients. The living world is seen to be a very clear manifestation of form follows flow at a fast tempo. These flows are not only evident in living systems, but in non-living systems as well.

While the idea of form follows flow is prevalent and directly observable among living forms, it is also applicable to the non-living world. Michael Weinstock talks about the geological landscape as having no ideal state, no singular 'natural landscape' that can be modelled; it is always changing.⁴⁵ From the long perspective of geological time, it is clear that 'nature' has no normal or fixed state, but is a continuing series of changing landscapes and climates, and that living organisms change and develop accordingly.⁴⁶ The earth itself - and all non-living forms that it is comprised of - are just as dynamic and ever changing as living beings. Living or non-living, objects are formations of matter, energy, space, and physical time; non-living beings generally experience processes of energy flow at a dramatically slower pace than living organisms. "Geological processes are also energy critical, the movement of tectonic plates and the raising of mountain ranges, the release of strain energy by earthquakes and the eruption of volcanoes are all powered by the flow of [energy]."⁴⁷ Weinstock continues to emphasize the nonliving world's dependency on physical time: "Non-living forms, the forms of the land, the forms of

clouds, snow and storms, dunes and rivers, are not permanent static things but dynamic three-dimensional patterns produced by the continuous physical processes of the natural world, and are constantly being broken down and renewed."⁴⁸ The nonliving world can no longer be viewed as a deterministic setting in which life happens. The processes that these forms experience are surprisingly life-like; the distinction between living and non-living, in terms of matter, energy, space, and physical time, is notably obscure. The conceptual marriage of living and nonliving is noted by Weinstock, "all forms emerge from the dynamic processes by which natural systems, both living and non-living, produce organized arrangements of material in space and time."⁴⁹

3.5 Architecture as Nature

As we blur the distinction between living and nonliving formations in nature, so too must we blur the distinction between natural and man-made formations. After all, the cities and buildings we build are as much a part of the laws of physics as natural forms, thus they ought to be looked at as an inherent part of the natural world. Representing the nature of man-made formations as separate or distinct from the rest of the world is, as we can conclude from this chapter's discussions, simply inaccurate.

PHYSICS OF
BEING

ISAAC NEWTON

PHYSICS OF
BECOMING

ILYA PRIGOGINE

OBJECTILE
PROCESS

GILLES DELEUZE

FORM FOLLOWS
FLOW

MICHAEL WEINSTOCK

ARCHITECTURE
AS THE
HARDENED EDGE
OF ENERGY

KIEL MOE



Cities are large scale formations that experience a flow of matter and energy causing them to change over time. The city behaves like an ecological system; the similarities go beyond simple metaphors. "Cities are dynamic forms, constructed spatial and material arrays that are reworked and rebuilt over time, decaying, collapsing and expanding in irregular episodes of growth."⁵⁰ It is formally and behaviorally evocative of a biological system. Weinstock describes the advent of the city as a phenomenon that "emerged from the extended metabolic systems of dispersed settlements, condensing into nuclei within integrated arrays of settlements, with an amplified flow of materials, energy and information, and an increase in social and cultural complexity."⁵¹ It is the formation of smaller assemblages of humans together into larger urban organizations to amplify flows of energy. The arrangement of buildings along the spines of streets is an example of how the city form follows the flows of people and goods through the system. The network of streets, and their hierarchical organization of primary, secondary, etc. arteries are what regulates flows of matter and energy⁵² and are directly comparable to the flow of rivers, or the veins of a leaf. Once again, we see that natural forms – no matter the scale; living or non-living; man-made or not – follow flows of energy.

Architecture, not unlike cities, the mountains,

rivers, plants and animals, is a temporal formation of matter and energy in space. Buildings are indeed systems of matter and energy within a context of flows discussed throughout this chapter. This reconceptualization of buildings is imperative for architecture to adopt the physics of becoming, and subsequently engage in its temporal nature. Temporal architecture is no longer isolated nor deterministic but is perpetually becoming, and is an inherent part of its context from which it cannot be separated. "Architecture can be thought of as a transformation of the material environment by changing living beings, an artifact continuously altered by use and circumstance, in constant degradation and repair before the aggression of time, permanently perishing and renewing itself."⁵³ Luis Fernandez-Galiano describes architecture as a transformation of an existing context, as a continuation of it. Perhaps even more importantly is the idea that buildings, like geological forms, have no fixed state.

"Time expresses itself by drawing matter into a process of becoming-ever-different."⁵⁴ Through material process, time is a simultaneous force of creation and destruction, wherein temporal architecture is perpetually becoming. It is, itself, an ever-continuing process within the world of processes. For architecture to engage in physical time it must be understood in

Figure 17 [opposite] *Mosaic Image of Berlin by Night*, Kuechly HU, Kyba CCM, Ruhtz T, Lindemann C, Wolter C, Fischer J, Hölker F [2012] "Aerial survey and spatial analysis of sources of light pollution in Berlin, Germany." *Remote Sensing of Environment*, 126:39-50 (2012). http://userpage.fu-berlin.de/~kyba/images/berlin_mosaic.html

this way. To reference the discussion in the previous chapter *Architecture's Resistance*, the topics of permanence, stasis, the ideal, and isolation can all be attributed to a lack of understanding the architectural object as an inherent player in the dynamic flows of the world's energy and matter.

NOTES

- 1 Luis Fernández-Galiano, *Fire and Memory: On Architecture and Energy* (The MIT Press, 2000), 4.
- 2 Sherover, *The Human Experience of Time: The Development of Its Philosophic Meaning*, 82.
- 3 Ibid.
- 4 Ibid.
- 5 Ibid., 159.
- 6 For spacetime, time - the measurement of when events (x,y,z,t) occur - is attributed to the *perceived time* definition provided in this thesis. Albert Einstein's theories on relativity that link time and perception together are universally accepted in the scientific community. This thesis does not argue against the theory, but explores the alternative view of time, physical time, as a distinct concept rooted in a biology.
- 7 Kwinter, *Architectures of Time: Toward a Theory of the Event in Modernist Culture*, 4.
- 8 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 56.
- 9 Peter Eisenman, *Written Into the Void: Selected Writings, 1990-2004* (Yale University Press, 2007), 16.
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- 13 "Understanding Matter, Energy, Space and Time: The Case for the Linear Collider," 2003, 2.
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- 15 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 4.
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- 17 Bruno Latour and Albená Yaneva, "Give Me a Gun and I Will Make All Buildings Move: An ANT's View of Architecture," n.d., 80.
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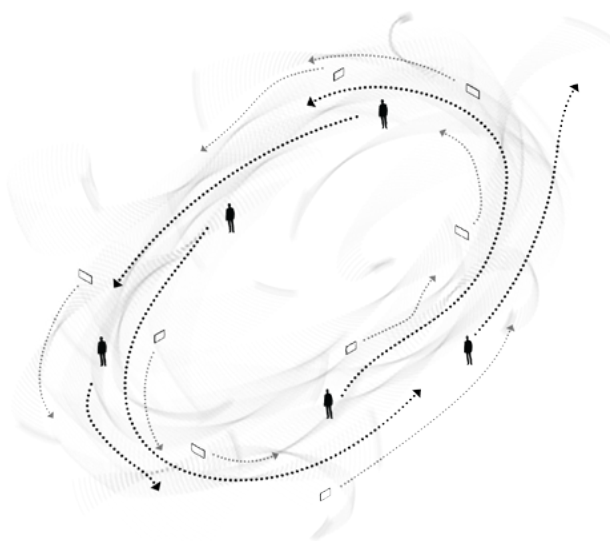
- 20 Ibid., 88.
- 21 Gail Peter Borden and Michael Meredith, eds., *Matter: Material Processes in Architectural Production* (New York: Routledge, 2012), 313.
- 22 Ibid., 313.
- 23 Ibid.
- 24 Jennifer Coopersmith, *Energy the Subtle Concept* (Oxford: Oxford University Press, 2015), 355.
- 25 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 22.
- 26 Borden and Meredith, *Matter: Material Processes in Architectural Production*, 314.
- 27 Wentworth Thompson, *On Growth and Form*.
- 28 Sherover, *The Human Experience of Time: The Development of Its Philosophic Meaning*, 174.
- 29 Ilya Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences* (New York: W. H. Freeman and Company, 1980), xi.
- 30 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 37.
- 31 Ibid., 35.
- 32 Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences*, xii.
- 33 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 35.
- 34 Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences*, xii.
- 35 Ibid.
- 36 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 36.
- 37 Ibid., 53.
- 38 Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences*, xvii.
- 39 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 57.
- 40 Ibid., 61.
- 41 Kiel Moe, *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture* (Birkhauser, 2014), 15.

- 42 Weinstock, *The Architecture of Emergence: The Evolution of Form in Nature and Civilisation*, 20.
- 43 Ibid., 22.
- 44 Rachel Armstrong, *Vibrant Architecture: Matter as a CoDesigner of Living Structures*, ed. Davina Jackson and Monika Michalowicz (Warsaw: De Gruyter Open Ltd, 2015), 5.
- 45 Weinstock, *The Architecture of Emergence: The Evolution of Form in Nature and Civilisation*, 16.
- 46 Ibid., 14.
- 47 Ibid., 16.
- 48 Ibid.
- 49 Ibid.
- 50 Ibid., 19.
- 51 Ibid., 186.
- 52 Ibid., 202.
- 53 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 4.
- 54 Kwinter, *Architectures of Time: Toward a Theory of the Event in Modernist Culture*, 4.

4

PHYSICS OF BECOMING

In chapter 3, *Time and Nature*, we established that architecture, and other non-living formations, are dynamical systems where matter and energy flow within and through them. These systems are continuously articulating themselves, and we have established that there is no true, ideal, finalized form in nature. This conception of architecture being inherently temporal was brought about by Ilya Prigogine's notion of a *physics of becoming* that marked a paradigm shift in our understanding of the universe. Architecture had seemingly not followed the new world conception that was brought about by 19th century thermodynamics and instead delved into an era marked by immateriality, purity of form and the celebrated expulsion of time. Architecture and physics – two complimentary fields that go back in history to classical times and beyond – had notably split upon the new dynamic world. For architecture to engage in physical time, it can look to thermodynamics – the science largely responsible for the physics of becoming – to adopt concepts relating to energy and material flow. With this, architecture will not



only be concerned with space and matter, but also with energy and physical time so that a more complete understanding of nature can inform the way architecture operates.

4.1 System of Energy

As outlined in the previous chapter, buildings are understood to be a system of energy. Architecture can be seen as an active and dynamic formation which experiences transformations and flows of energy.¹ Referring to architecture as a system is important because it implies that this collection of energy and matter does work; it is not simply moving around inconsequentially. It functionally maintains its form and interacts with its surroundings through flows of energy. Seeing architecture as a system of energy is a significant departure from the current praxis of energy which is largely in the realm of building science, often dealing with heat transfer through the envelope among other things. This thesis doesn't discredit that practice but instead presents a different approach to energy rooted conceptually in thermodynamics. Kiel Moe talks about the need for architects to broaden their approach to energy based on his critique that insulation is a manifestation of an isolationist view of architecture and buildings. "To insulate is to isolate"² is the foundation of his premise that a broader view of energy needs to be considered

in architecture. The issue with insulation, he says, is that it "taught modern architects to resist the flow of energy"³ and "has proved to constrain how architects understand what constitutes energy and its thermodynamic behavior in architecture, not to mention its connection to life itself."⁴ Instead of a mere container in which energy moves through, Kiel Moe views architecture as "the temporary, hardened edge of great energy and material flux that can only be characterized as non-isolated formations of energy captured in matter, around space, for finite durations."⁵ What is important to note is the idea that architecture is transient, finite, temporary. We have previously established that architecture has no ideal, final form, and is constantly subject to the process of change by the very nature of its existence. Kiel Moe brings this one step further by declaring architecture as a temporary structure; as a collection of matter and energy into a relatively stable form for a time, before that system dissipates.⁶ The other important point from Kiel Moe's ideas of energy in architecture goes back to his main critique of buildings being seen as isolated structures. The flows of energy that constitute architecture – and flow through it – connect buildings to their context in a way that reveals how any isolationist attitude towards architecture has no grounds.⁷ It is both scientific and poetic to say that architecture is inherent to the flows of its landscape;

building and landscape cannot be separated. Not only does the context shape architecture, but architecture also shapes its context; both the system and its surroundings interact with each other and all other systems around it.⁸ These concepts of architecture as transitory and connected to its surroundings lead us towards the science of thermodynamics, and what it has to say about the flows of energy in the universe. First, we can look to the different types of energetic systems and how they interact with their surroundings.

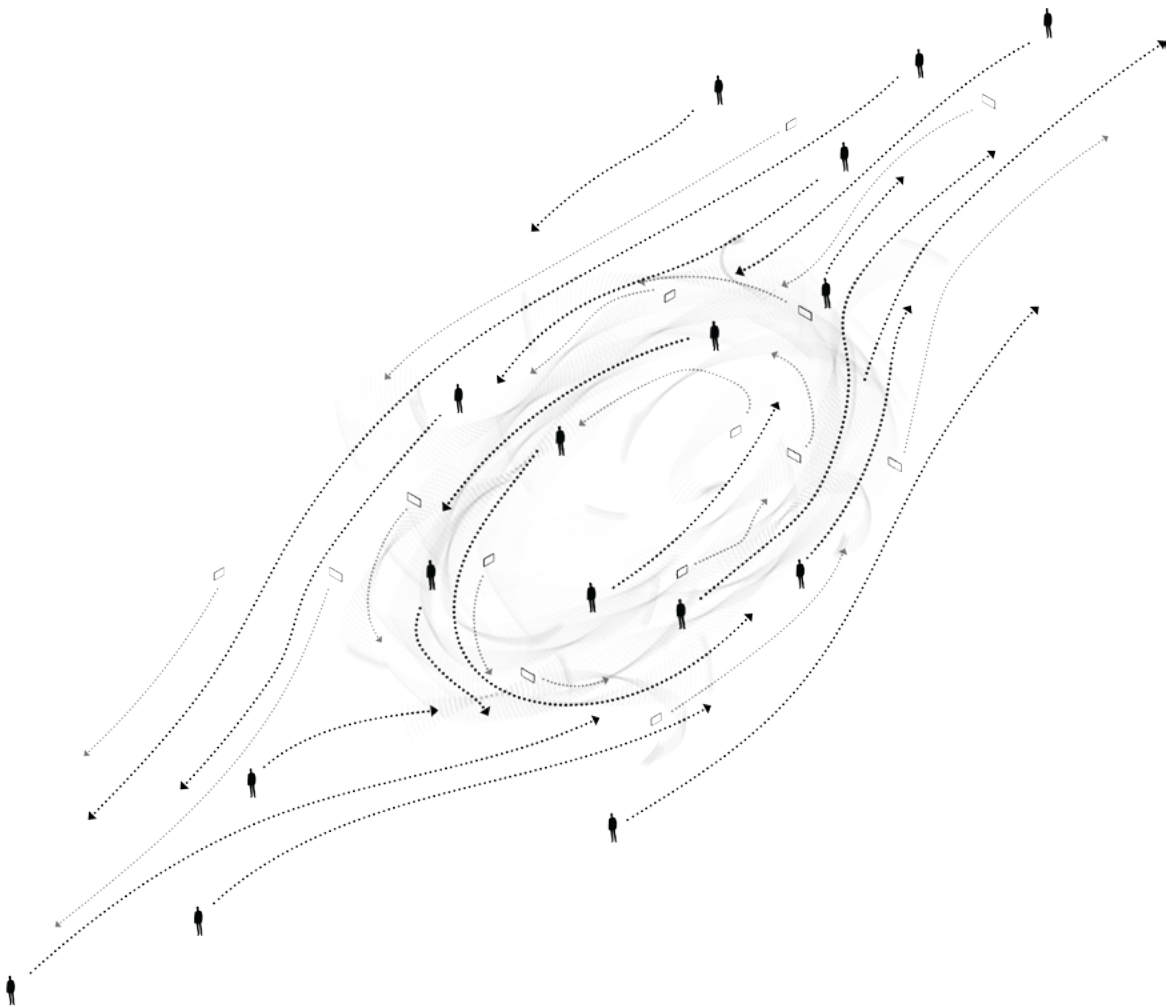
4.1.1 Isolated, Closed, Open

The world, the landscapes in it, living and non-living formations, microscopic organisms, and, of course, architecture can all be described as energetic systems. Systems of energy consist of three elements: the *system* itself, its *boundary*, and its *surroundings*.⁹ The system (the matter and energy that encompass a system) and its surroundings (the matter and energy outside of the system) are quite straightforward, but the boundary is not always so clear. The boundary may be a physical edge to a system, although is more accurately described as the place where energy transfer occurs.¹⁰ “The boundary is less an object than a stated type of exchange, a change in behavior, or a shift of energetic activity pertinent to the analysis at hand.”¹¹ One common example used to explain systems

of energy is a water bottle. The system is the bottle itself and the water inside. The system boundary is the edge of the bottle, and the air in a room is the surroundings. We’ll use this example to conceptually explain the three types of systems that exist: *isolated*, *closed* and *open* systems.

An isolated system does not allow for the free flow of matter nor energy through the system boundary. A closed system does not allow for matter to pass the boundary, but energy may be transferred. An open system allows for the transfer of both matter and energy through the boundary. A water bottle with its lid open can be considered an open system: water and air may freely enter and leave the system, and energy may transfer through the bottle itself: warm air outside of the bottle will warm up the water inside. The same bottle with its lid closed may be considered a closed system. No air or water may enter or leave the system, but the transfer of energy through the boundary still occurs. Now consider a thermos where no energy transfer may occur between the system and its surrounding energy. The air may heat up, but the water remains the same temperature inside the system. This can be thought of as an isolated system.

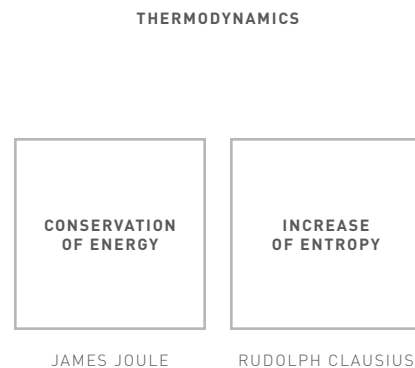
Of course, these examples are extremely simplified and should only be used to conceptually understand the three types of systems. In reality, the thermos is not an isolated system, it still experiences energy



transfer from its surroundings. In fact, nothing in the universe can truly be considered an isolated system, except for the universe itself (as far as we know). As already established in the previous chapter, every real object is a collection of matter and energy that interacts with its surroundings; just at varying speeds. As Kiel Moe notes, architecture is an open system of both matter and energy exchange: "Human bodies, buildings and cities are examples of open systems. Each of these open systems will exchange many forms of matter and energy over time with its surrounding milieu. Bodies, buildings and cities not only exist and survive as open systems, but they also thrive as open systems."¹² The energetics of architecture is notably more broad and complex than architects may often realize. The idea of architecture being an open system of energy and matter coupled with the previously discussed concept that architecture is not only the container for energy but is *itself* the "hardened edge of energy"¹³ is revealing in the creative potential for energy in architecture. The open system concept also helps illustrate the idea that architecture is but a transitory state for the matter and energy that encompass it.

4.2 Thermodynamics

Under the physics of becoming, architecture can be conceived of as an entity that 'lives'



and ‘interacts’ with its surroundings. This view of architecture is closely influenced by the laws of thermodynamics. Classical thermodynamics, the science of energy flow and relationships between forms of energy, emerged in 1850 from the research of James Joule, who developed the theory of the conservation of energy, and Rudolph Clausius, who is responsible for the concept of increase of entropy. Energy and entropy together “make up the two conceptual pillars of thermodynamics.”¹⁴ Joule’s conservation of energy became the first law of thermodynamics. It states that “energy can neither be created nor destroyed. Therefore, all energy that will ever exist already exists; it constantly changes form.”¹⁵ The second law of thermodynamics, *entropy*, suggests that any process of energy transformation results in an increase of entropy (disorder) in an irreversible fashion. This implies that systems of energy tend towards maximum entropy (total disorder). This state is referred to as *thermodynamic equilibrium* where the energy of a system no longer does work or is subjected to processes¹⁶; this is also called *heat death*. For this thesis, it is also when physical time comes to a halt. Entropy speaks to the inevitability of change that an organization of matter must experience, and explains why permanence and perpetual motion are physical impossibilities.

4.2.1 Architectures of Energy

The architectural implications of the first law – that energy can only be transformed, never created or destroyed – impacts the way we understand material form. To reference back to the discussion on matter in chapter 3.2, Kiel Moe’s point about how matter is captured energy, in the context of the first law, is telling. It implies that buildings are a transformation of their environment. The material that encompasses architecture cannot be viewed in isolation, rather it is merely one state in its continued existence. The substance of architecture, therefore, has a life before the project, and a life after it as well.

The first law links buildings to their context at a fundamental level. Architects can no longer carry the conception that the resultant object of their designs behaves the way it does in drawings or digital models (that is, appear out of thin air or imagination). The dematerialized notion of pure form that became popular in mid-century modernism goes against this idea of a temporal architecture. To strip form of its material expression is to strip it of its embedded nature; it decontextualizes it. What results is architecture that expresses itself as a foreign object placed into a landscape, and carries the implication that it is beyond the forces of nature; that it is beyond time.

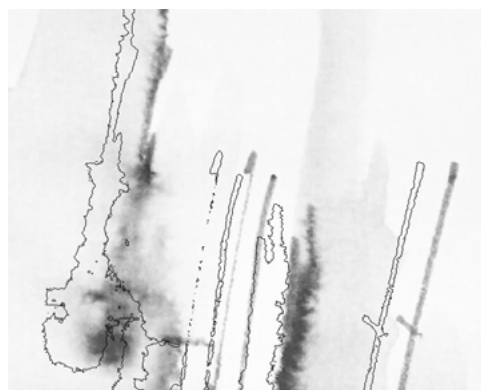
4.2.2 Architectures of Entropy

According to the second law of thermodynamics, systems of energy tend toward disorder through the process of energy transformations. Higher entropy (or disorder) results in energy that is less productive; maximum entropy, or the state of *equilibrium*, is where the energy is so disorganized that it cannot be used for any function; the productive flow of energy ceases. The entropy law tells us that processes are irreversible, which brought time and its directionality into physics. It ultimately tells us that no system of organization can escape degradation; entropy is the true rival of *Firmitas*.

For architecture, this is seen in the physical decay of material. The material forms that constitute a building persistently interact with the surrounding milieu of energy. Through these interactions, energy is dissipated as heat, and results in a less orderly composition. Over time, as we can observe in the world around us, material is subject to weathering and decay, and buildings require a frequency of restoration in order to be maintained as intended. Architecture cannot avoid the inevitability of the second law of thermodynamics.

The second law begs the question of how organized form comes into existence. Nature, organisms, cities, buildings, etc. are all highly ordered systems, so how does order

emerge in the world? This consideration leads us to non-linear thermodynamics. Classical thermodynamics is primarily concerned with the study of closed systems of energy; it is in these systems that a linear production of entropy is observed.¹⁷ However, natural forms, whether living or non-living, including architecture, are actually open systems. Linear thermodynamics has its applications, but a look to more modern non-linear thermodynamics that is applicable to open systems is necessary to learn about its application to architecture and its formation.¹⁸



4.3 Nonequilibrium Thermodynamics

Non-equilibrium thermodynamics emerged from examining the behaviour of open thermodynamic systems, such as buildings or trees. "Not only are these systems open, but also they exist only because they are open. They feed on the flux of matter and energy coming to them from the outside world...They form an integral part of the world from which they draw sustenance, and they cannot be separated from the fluxes that they incessantly transform."¹⁹ Both living and non-living formations exert life-like behaviors of energy interaction with their surroundings. It is through these interactions where we see open systems combating the entropy law, giving the world organized life. To put it simply, open systems resist the production of entropy by feeding on low entropy (or, energy in a highly ordered state) from its surroundings. Through this continued interaction, the system can create organized order and effectively persist at a state far from equilibrium. From systems behaving in non-equilibrium ways, we get organized life, the formation of rocks, growth of trees, development of cities, technology, and, of course, architecture.

A system can combat entropy through the *continued production* of creation. What this says about architecture is that it cannot be understood in the traditional sense of

having a construction phase then followed by occupation. There can no longer be a 'finished' state of a project which is then passed onto its inhabitants. Architecture can never be understood to be finished when looking at it as an open system. The process of making can continue to act on the project through its entire existence, bringing about a new way of approaching architecture that accounts for the idea of process over substance. The implications of non-equilibrium thermodynamics are mostly realized in the long-term existence and persistence of buildings. Similar to how cities are formed, or the mountains, the behaviour is not observably apparent.

An architecture of continuous creation can be realized through its material tectonics and an acute awareness of its energy flows. The material that comes together to encompass the project can be understood to be transient. This continues the concept of an architecture of energy where the substance of architecture has a life before and after the project as well. The material that leaves the system is replaced by new materials and energy, allowing the project to persist. This results in architecture that focuses on the detail of how the material is brought together and how energy flows, rather than simply its form.

4.3.1 Dissipative Structure

The process of creation that persists through temporal architecture's existence allows for the project to expand (and contract) according to the programmatic activity that occurs. The resulting growth can be referred to as *amplification*, which speaks to the increase of material energy brought into the system.

Through the constant amplification and dissipation of energy through the system, the project persists as a temporal form that continuously fluctuates over its existence. The inflow (and outflow) of the transient material evokes Ilya Prigogine's idea of the dissipative structure, where the overall form is defined by the flows of energy through it, and maintains itself far from equilibrium.²⁰ From the pulsing of energy emerges a particular order for a particular time, but never has a final, ideal state of existence.

The role of this notion of the dissipative structure in architecture can be productive in terms of its context. In the long term future of a built project, the material energy that is brought into the project from amplification is eventually no longer required or suitable, and is removed from the system. The material, as discussed, has a life after the project as well, which is realized through its re-use in other future architectural projects in its surrounding context. This leverages the demand for increased material from amplification for



Figure 22 [above] dissipative structure example: *Belousov-Zhabotinsky Reaction* <https://cias.rit.edu/faculty-staff/256/faculty/1352>

the use of its context – strengthening the relationship between project and context. In this sense, the project can take advantage of the fact that architecture is an open system.

NOTES

- 1 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*.
- 2 Moe, *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture*, 14.
- 3 Ibid., 15.
- 4 Ibid., 14.
- 5 Ibid., 20.
- 6 Ibid.
- 7 Ibid.
- 8 Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences*, 84.
- 9 Kiel Moe and Ravi Srinivasan, *The Hierarchy of Energy in Architecture: Energy Analysis* (Routledge, 2015), 5.
- 10 Ibid.
- 11 Ibid.
- 12 Ibid., 6.
- 13 Moe, *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture*, 20.
- 14 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 46.
- 15 Lisa Moffitt, "Thermodynamic Optimism: Three Energy / Material Dialogues," *Edinburgh Architectural Research Journal* 33 (2012): 2.
- 16 Dilip Kondepudi and Ilya Prigogine, *Modern Thermodynamics: From Heat Engines to Dissipative Structures* (John Wiley & Sons Ltd, 1998), 6.
- 17 Ilya Prigogine, *Introduction to Thermodynamics of Irreversible Processes*, 3rd ed. (John Wiley & Sons Ltd, 1955), 3.
- 18 Ibid.
- 19 Moe, *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture*, 21.
- 20 Prigogine, *From Being to Becoming: Time and Complexity in the Physical Sciences*, 84.

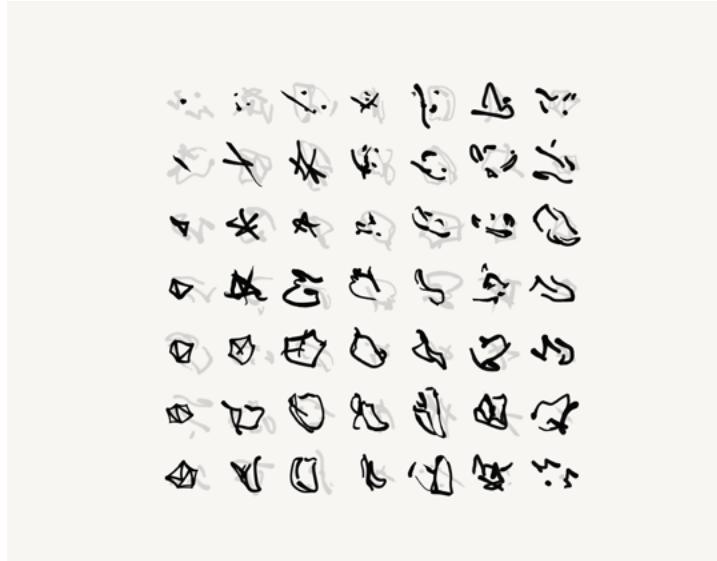
5

PRIMACY OF PROCESS

*"The more we delve into the nature of time, the more we shall understand that duration means invention, creation of forms, continuous elaboration of the absolutely new."*¹

Thinking about architecture as a system where the dynamics of process regulate formal composition – as opposite to form regulating dynamic processes – presents an architecture where primacy is given to the process. Architectural form exists as a *transient formation* of processes. Geometry becomes an illustration of the act of making, allowing architecture to be expressive of its nature. Because the system of energy experiences continuous transformations and interactions of energy, the act of creation is perpetual, which depicts architectural form as a momentary state in the system's continuous process of becoming.

The method of conducting this thesis aimed to embody the argument for the primacy of process in architecture. The process oriented approach to design is represented in **[Figure 23]**. The drawing is an investigation into the primacy of process in design. The intention



is for the viewer to attempt to navigate from one glyph to another through a sequence that represents design process. The rationale for each move from one to another should be based on some decided logic: perhaps the next glyph must be larger than the previous, be similar in appearance, or appear to be unfolding. The idea is that each person who approaches the navigation of this piece will inevitably carve their own path through the matrix. There are many different ways to navigate the drawing, each requiring a unique method of approach. The end goal is achieved only through a specific process; any other mindset would result in a radically different arrival point. In essence, the drawing demonstrates how process is crucial to design

and should precede any notions of a finalized state. This method allows for the freedom of discovery to guide the project, where each 'step' does not try to justify a preconceived end, but draws the designer towards the next idea. This method was utilized in the creation of this thesis; the early renditions of which are shown in this chapter as *design research*.

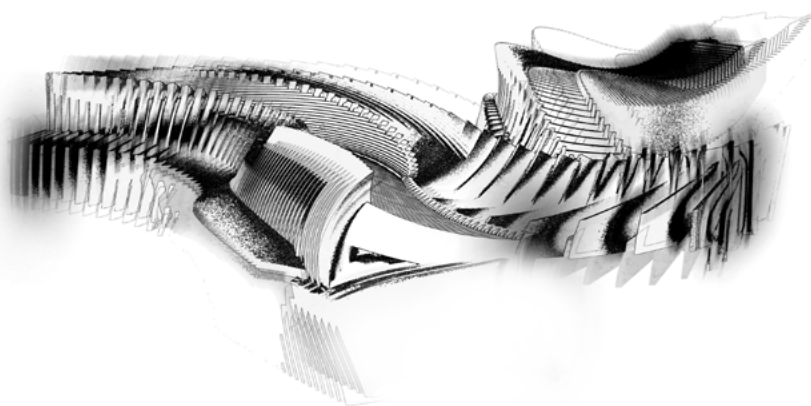
The design research and traditional research were conducted simultaneously throughout the earlier stages of this thesis work, despite being presented in sequence in this text. Design work and topical research were engaged together in process, giving the method of work an element of discovery. As such, the works presented below were completed at varying times during the research and writing of the previous chapters



and therefore represent my own incomplete understanding of the topic and concepts at their respective times. This method of conducting research embraces the thesis argument at a meta-level where the 'unfinished' is embraced; each act of design is but another step in the thesis' continued *becoming*. The value of the design research drawings [Figures 25-29], for the thesis, was in the *act of making* the drawing. During the act of resolving a drawing, the piece is still active, and the designer consciously works through the tension of concept and representation. The ideas meant to be instilled in the drawing are at play, and allow for the possibility of revelation or a learned experience from the designer. The *act of making* is where the value for the thesis is present because once the

drawing is finished, the cognitive connection is, for the most part, over, and the drawing remains a relic of process.

Four of these process works of design research are presented below, where each draws reference to particular points in the previous chapters from which they emerged, or helped manifest.

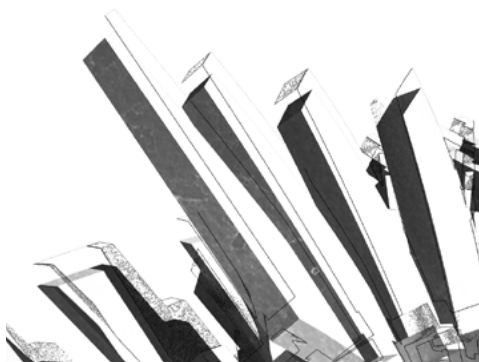
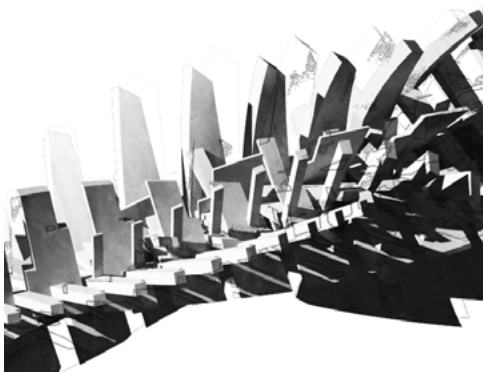
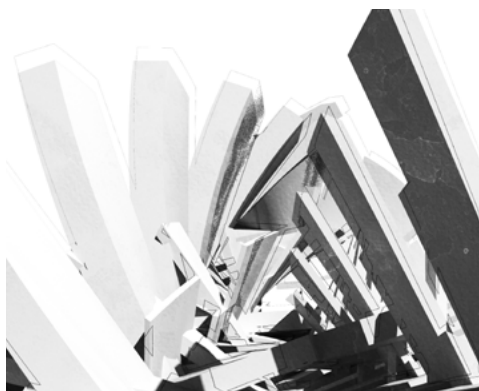
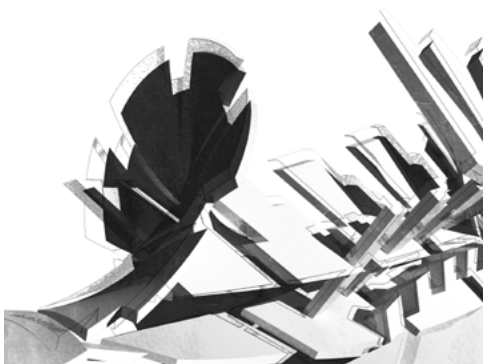


Objectile

The investigation of objectile, the concept discussed in chapter 3.1, had emerged from an earlier look at futurist art and the methods used to portray movement and time. Umberto Boccioni is one influential figure from the movement who stated that “objects, as they are in reality, are in a constant state of movement.”² The attempts to capture movement in art drew parallels with the notion that architecture is constantly changing. Through an examination of movement in futurism, a concept emerged that had a stronger connection to architecture’s becoming. This idea is that the object, in futurism, is continuously discovering itself in time; it is never ‘discovered’.³ The discovery through time suggests an internal becoming. The objectile becomes inherently temporal; it is continuously discovering itself through

time. The design research began as an attempt to capture this notion.

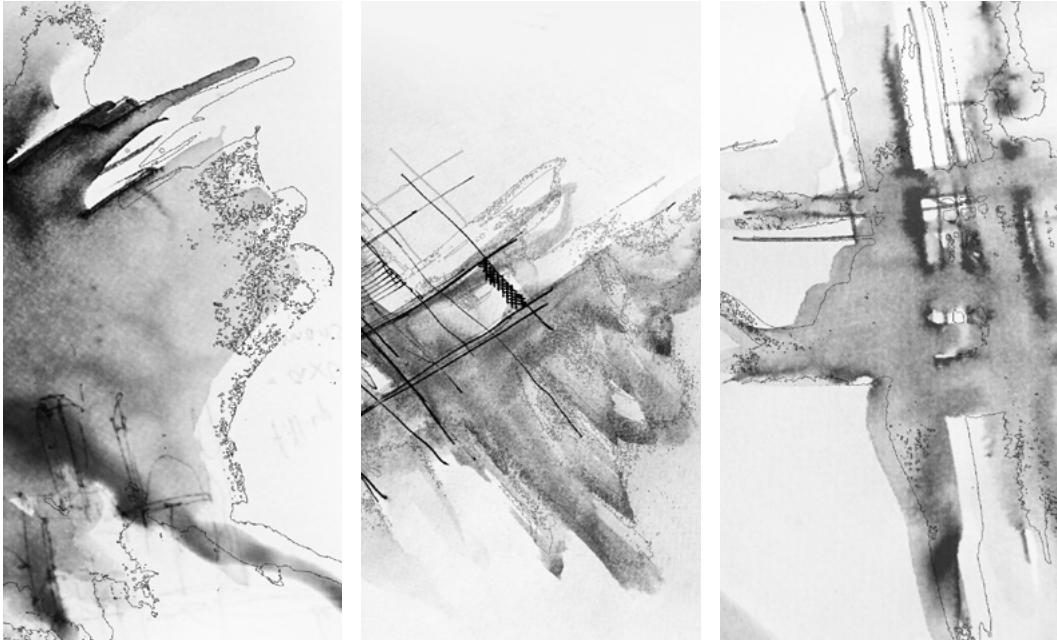
The *objectile III* drawing [Figure 25] attempts to present the sense of an object’s ‘flight’⁴ while also communicating the idea that the objectile has no final state with its sweeping form fading into the distance. The dynamic motion suggested steers the drawing away from the issue of rigid repetition that was present in the previous iterations of the drawing (refer to Appendix 3). The objectile discussion adds to the conception of temporal architecture by changing our thinking about objects in space. Architecture itself is an objectile, it is an assemblage of objectiles, and it contains objectiles. Each of these facets undergoes a process of variation and discovery.



Tempo

The concept of tempo emerged from researching the topic of entropy and what it says about time. In the thermodynamic sense, duration is linked to the processes of energy flow which occur in an object. For entropy, the "increase in entropy is greater the faster the transformations and this links the speed of processes to the increase of degradation."⁵ The process of transformation fluctuates. It can speed up and slow down depending on various factors that affect matter and energy flow. In this sense, time is no longer seen as a medium in which objects exist, like space, but is rather a localized event that can speed up and slow down dependent on the processes which occur. In other words, time is not constant, and it is not universal. This localized speeding up and slowing down can be referred to as *tempo*.⁶

The *Tempo I* drawing [Figure 26] attempts to capture this notion through architectural forms in a grouped series of objectiles arrayed, warped and distorted along their own paths. Each arrayed series intersects with another individual series. The process of transformation in each series is local, suggesting that it experiences time in its own manner. This tempo model aided in furthering the ideas started with the objectile drawings, and suggests that architecture is an assemblage of individual entities which experience processes at their own rate.



Entropy

The *Entropy II* drawing [Figure 27] investigates the tension between order and disorder that is characteristic of open thermodynamic systems with the use of ink and paint. The first entropy drawing (refer to Appendix 3) depicted a closed system where the organization tends towards disorder. It is linear and isolated. Architecture, as discussed, is not isolated - it is an open system of energy exchange within its contextual system of energy flows. This is where entropy is most critical in developing temporal architecture. What is depicted in *Entropy II* is an abstracted drawing of an architectural formation shown with lines of varying thicknesses. These lines are representative of an open system

of organization which is in a current state of order. The strokes of paint distort portions of the formation, signifying its fragile state of energy balance, while also conveying the symbiotic process of energy exchange in its context. It is that constant flow of energy which gives the formation its consistency – its continual existence.⁷

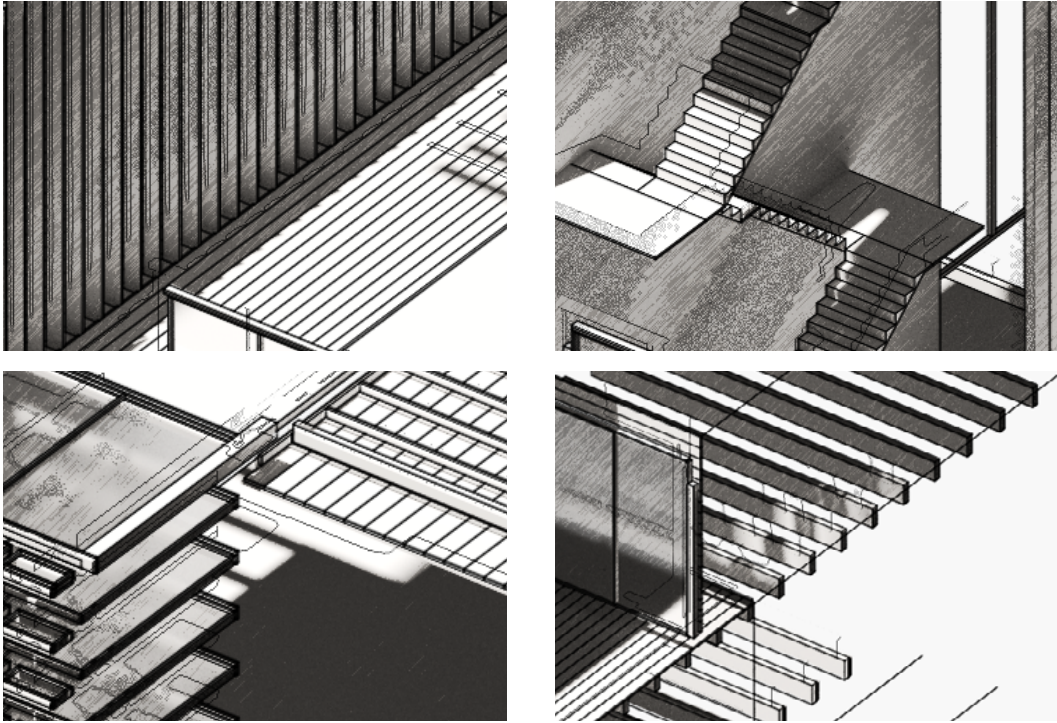
"The consistency of a candle flame, a whirlpool's shape, a star's morphology, a cell's or a living organism's homeostasis, cannot do without a certain thermodynamic disequilibrium, that is, some energy flow running through them. Rather than destroying the system, the flow feeds it, contributing to its very existence and organization. What is more, stoppage of the flow leads to the degradation and ruin of the system."⁸



The painted wisps of energy suggest the fragility of the system. In a case of radical imbalance in the flows of energy, the formation turns to dust. With this, the drawing reveals the homeostatic nature of material formations. The drawing begins to suggest that architecture is not only an initial formation of matter and energy, but its continued existence *depends* on the constant inflow and outflow of energy to maintain itself. It is an open system which, through these interactions, finds itself in a dialogue with its contextual flows of energy. This relationship lends itself to the world's increasing tendency towards complexity and entropy.

The investigations into entropy are the most complex and seemingly difficult to find a

direct translation into the development of architecture. The experiments, however, have been arguably the most important in the development of a new conceptual groundwork for temporal architecture. Entropy is the "true author of the demolition of the conceptually mechanistic world"⁹ and brought about the thermodynamic paradigm. It links the world together into a system of interconnectivity in which architecture is a major part. The ideas uncovered through design research and topical research have begun to appear, however subtle, in many of the other facets of design. It became more and more clear that entropy was becoming one of the major conceptual cornerstones of a new temporally conceived architecture because it begins to show what the flow of



energy means in material formations.

Simultaneity

The examination of simultaneity originated as an intent to discover how time could be represented in architectural delineation. It came directly out of the critique that the ideal of the project is typically devoid of time, and architects' depictions reflect that absence. The initial question of how to make drawings temporal lead to cubist art. Cubism moved on from a (Renaissance) traditional conception of space in its perspectival disposition towards a new conception of space intrinsically linked to time. "[cubism viewed objects] simultaneously from all sides - from above and below, from inside and

outside. It goes around and into its objects. Thus, [through simultaneity, it has added the dimension] of time."¹⁰ Pablo Picasso's *L'Arlesienne* is a notable example of this where he shows different sides of the face at different times in one painting.

The concept of simultaneity for architecture is about understanding an object in its entirety through an aggregation of individual views, or elements, in one's mind. For instance, the movement through a hallway, up a flight of stairs, through an atrium and into and out of rooms creates a series of moments within the mind which, when put together, begin to create a composite understanding of the building as a whole. John Hejduk talks about how "Simultaneity has always been a complex phenomenon with reference to

Figure 28 [above] *Simultaneity IV Vignettes*, by author

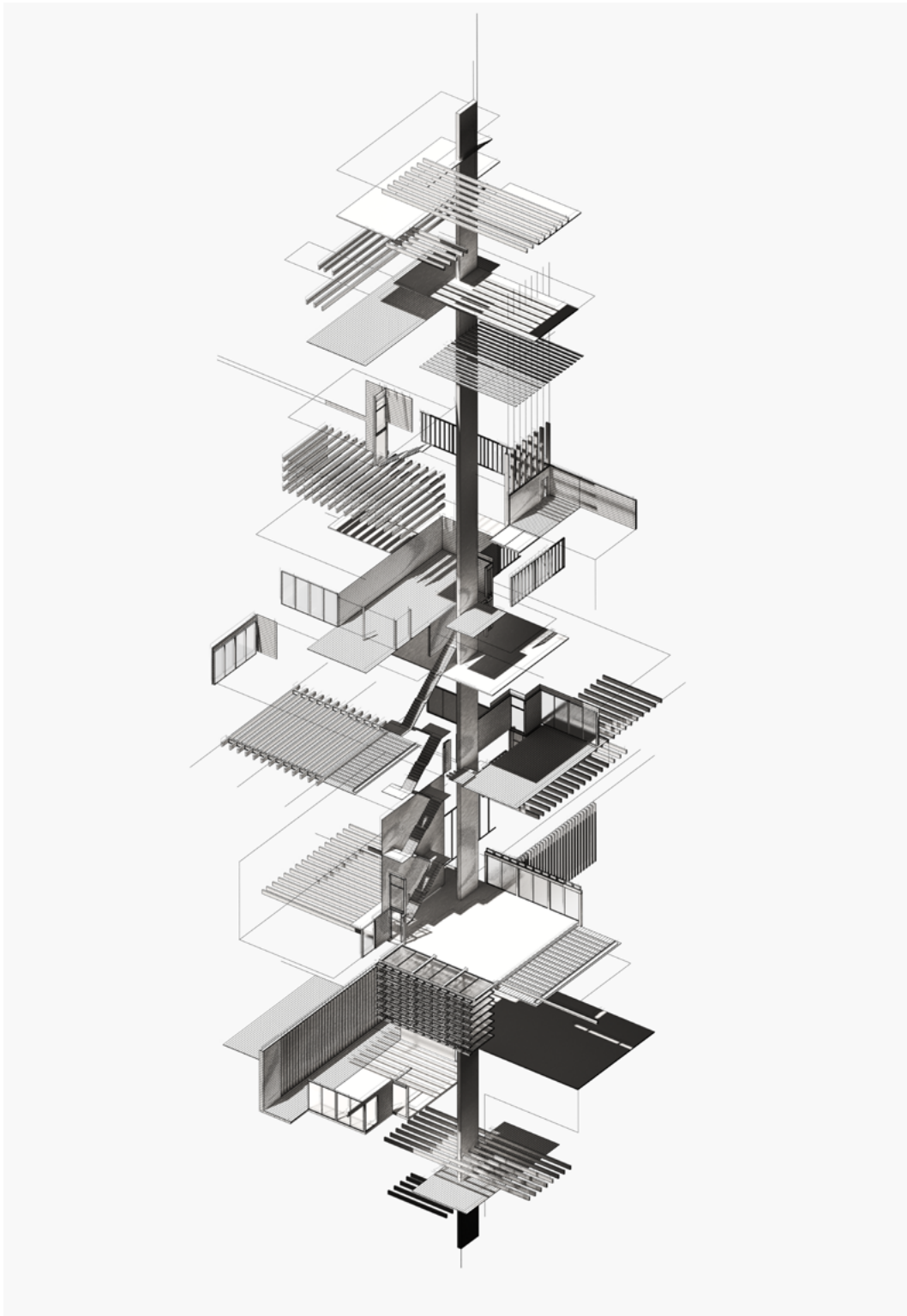


Figure 29 *Simultaneity IV*, by author

the retina's capability of maintaining hold over kaleidoscopic relationships."¹¹ The work of simultaneity in this thesis takes this concept, but rather than explore it through a personalized experience of movement through space, it will be an objective investigation of the architectural object through an operation of exploding and unfolding the form into individual components, views, drawings, etc. In a similar manner to how aggregate memories of a space create a greater understanding of the whole, the aggregate components and views in the *Simultaneity IV* drawing **[Figure 29]** aim to create a greater understanding of the object, but with the elimination of subjectivity. *Simultaneity IV* becomes inherently temporal in the sense that it presents a collage of times in the building's continuous becoming. This analysis allows us to focus on how architecture 'experiences' time.

NOTES

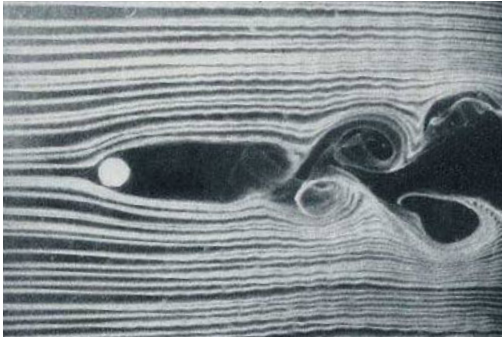
- 1 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 57.
- 2 Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, 441.
- 3 Ibid., 440.
- 4 Latour and Yaneva, "Give Me a Gun and I Will Make All Buildings Move: An ANT's View of Architecture."
- 5 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*, 50.
- 6 Ibid., 55.
- 7 Ibid., 98.
- 8 Ibid.
- 9 Ibid., 53.
- 10 Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, 432.
- 11 Hejduk, *Mask of Medusa*, 71.

6

PRINCIPLES OF TEMPORAL ARCHITECTURE

It would be appropriate to repeat Heraclitus' famous quote referenced at the beginning of this thesis: "No man ever steps in the same river twice, for it's not the same river and he's not the same man."¹ The spirit of the thesis is captured in this quote, and now that we've discussed time through metaphysics, evolution and thermodynamics, the quote seems all the richer; we now understand architecture in a similar way. Heraclitus' quote depicts the change that happens to both the river itself and the person who steps in the river. For an investigation into architecture and time, both must be understood; that is, both the tangible and intangible. The building cannot be separated from the human aspect of events, happenings, and experiences; and likewise, the incorporeal cannot be separated from the building it is associated with. Heraclitus elegantly ties together how the tangible and intangible are, together and inseparably, temporal. To work towards a temporal architecture, one would have to address both aspects.

At this point in the discussion we'll transition towards the ways architecture can engage

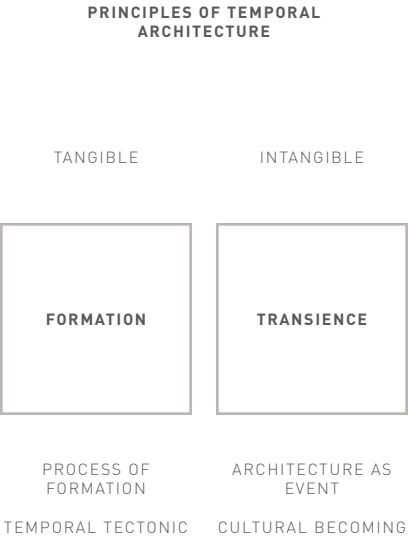


in the temporal concepts from previous chapters. The tangible and intangible, as mentioned, will serve as the two avenues for exploring how the temporal concepts can change the way architects approach design. The intangible is related to the activity, program, and by extension, the inhabitants of architecture. The events that are associated with program are inherently dynamic, and architecture cannot be conceived without its associated occurrences; architecture is not simply a material form for the sake of itself, but possesses an inherent purpose. The second aspect for exploring temporal concepts in architecture will be the material reality of architecture; its physical form itself. Each of these avenues - the tangible and intangible - are momentary and temporal. Traditionally, as argued throughout the thesis, these aspects are understood in their ideal, static form. What is absent, of course, is the temporal reality that we have explored through metaphysics, evolution and thermodynamics

in the previous chapters.

The two avenues of architecture will be investigated through the lens of time and synthesized into two respective principles for a temporally informed architecture. These will then be tested in the context of an architectural design project. The first principle, titled *transience*, engages the immaterial aspects of time in architecture, and views human activity and program like an open system of flows. The second principle, called *formation*, investigates time and energy in relation to the tangible, material form of architecture. This chapter serves as an overview and transition point, and the following chapters will go further into each principle, and reveal how the design project will embody the ideas.

Through a temporal lens, any built work is a *locus* for the material and immaterial facets that embody its actuality. That is to say, it is the gravitational point where these facets come together in a particular place for a particular duration; the material and immaterial are not spatially nor temporally confined to the built assemblage that is architecture. The *locus* comes out of the thermodynamic *open system* concept for energy flow, applying the ideas of thermodynamics to the two principles of temporal architecture. Both the tangible and intangible exist before and after they enter into the *locus*, and experience perpetual change, irreversibly.



6.1 Transience

Transience looks to the behaviour and activity of people in architecture. Preferably referred to as the *actants*, rather than users or visitors of a building, *actants* implies an active role in architecture. Defined as being “a person playing any of a set of active roles in a narrative,”² the term, borrowed from literature, depicts the relationship between people and the ‘narrative’ of architecture’s *transience*. When we look at architecture as a *locus* of activity brought about by *actants*, and draw parallels between the ideas of open thermodynamic systems, we can view *actants* much like flows of energy in these systems.

The *culture* of a piece of architecture is formed from the assemblage of actants who engage in the project, and all collective events, occurrences, ideas, creations, experiences, etc. As the locus for this activity, the culture continuously changes as new actants bring new influence and ideas as others leave. As such, the system constantly renews itself; its identity and soul passing to the new; remaining forever *transient*. The principle of *transience* aims to encourage and strengthen the continued articulation of *cultural becoming*. Spaces are provided to encourage activity, encounters and events, while a traditionally deterministic program is argued to hinder *cultural becoming*. Spaces

for socializing, collaboration and encounters, coupled with spaces focused on the individual for contemplation, productivity or relaxation, form a flexible basis on which actants who inhabit the given spaces may interpret and utilize spaces in their own manner. As new actants come into the system to replace the previous, they are inheriting the spaces of contingency, where they will continue the lineage of culture by their own means.

Cultural becoming is concerned with the collective activity of architecture, while *personal becoming* focuses on the individual actant, and how they change as a person. This brings us back to Heraclitus’ river analogy. The man who steps into the river the second time has indeed changed since the first encounter. All of the conditions and occurrences that people surround themselves with in their daily lives contribute to the individual’s personal development, or *personal becoming*. Like the discussions on material form and energy flows, a person cannot be understood in a static cross-section of their lives. The second time one steps in the river, so to speak, they have indeed transformed. The principle of *transience* argues for a reversal of this analogy as well. Not only is it a different person stepping into the river the second time; but it is a different person *stepping out* of the river as well. With temporal architecture, we can recognize the *personal becoming* that an actant experiences perpetually while

inhabiting architectural space. Architecture impacts and contributes to this change as they engage in their context.

6.2 Formation

Formation looks at the physical, material organization of architecture through a similar temporal lens as *transience*. The assemblage of material that constitutes a building is as dynamic and subject to *becoming* as the events that transpire within its walls. As we have already established in the previous chapters, matter is captured energy, and therefore the material of architecture is but the hardened edge of energy flows. The principle of *formation* engages in these material dynamics through *temporal tectonics*, an interpretation of architectural tectonics where the building serves as a locus of *material flow*. The *detail* expresses the process of making and craftsmanship, and time is expressed in *energy processes* and its effects on material.

The processes of energy flow and transformation through material form has been looked at as the creative force in the world that shapes and sculpts matter. For architecture, the processes of energy flow are always present, influencing the material assembly of the building. The effects of light, heat, moisture, and wind paint their effects on material over time - which architects

may typically understand to be degradation that needs to be avoided - is, on the contrary, the creative engine of energy at work; it is a *becoming*. Material tectonics simply cannot be fully understood without an inclusion of these temporal effects of energy on material. *Temporal tectonics* acknowledges these effects and aims to elevate these flows of energy towards functional application and artistic expression.

Energy processes are not only seen in the transformation of material over time, but also apply to the construction of architecture as well. Being referred to as the hardened edge of energy flow, materials can be expressive of the process of making, and *temporal tectonics* aims to exemplify that process through design. The curing and treatment of concrete, or the Japanese cedar burning technique are two examples where the expressive use of energy processes heightens one's sense of the process of making.

NOTES

- 1 Plato, *Cratylus*, n.d., 402a.
- 2 "Oxford Dictionary," Oxford University Press, n.d., <https://en.oxforddictionaries.com/>.

7

LOCUS

As we shift from talking about time in the context of nature and physics towards the context of architecture, a *locus* for the discussion must be established. A *locus* refers to, firstly and most obviously, a location. It is defined as “a particular position of place where something occurs or is situated.”¹ A particular locus brings with it a set of conditions - environmental, cultural, historic, and so on - that architecture must enter into a dialogue with for it to be found *in situ* with its context. Beyond its location, the *locus* is also the centre of an occurrence. It is the location associated with an event, or a duration. In viewing architecture as a process, as transient, as a formation, as temporal, it is fitting to understand its relationship to site in this particular way.

The term *locus* is first and foremost about a position, indeed, but it also has a more theoretical definition. It is the “effective perceived location of something abstract.”² For example, when saying ‘the locus of power’, you are not necessarily implying a physical location, but a more conceptual point of genesis. For temporal architecture,

a project forms the conceptual locus of ideas and culture; it is the manifestation and continuation of occurrences that are not constrained by a building's walls but exist as ideas associated with the project's identity. The locus is the convergence **[Figure 32]** of these occurrences in a place, for a time. Similarly, it is the convergence of matter and energy into the system. These tangible and intangible aspects together form the locus of an architectural project.

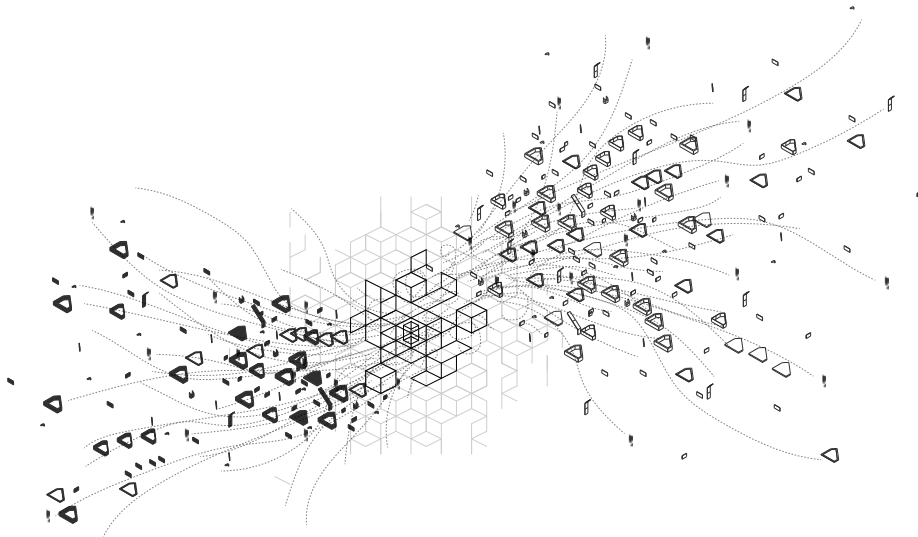


Figure 32 [above] *Convergence*, by author



Figure 33 [top] *Waterfall* <https://theultralinx.com/2016/08/random-inspiration-253/>

Figure 34 [bottom] *Richardson Mountains, Springlake* <http://www.panoramio.com/photo/102492648?source=wapi&referrer=kh.google.com>



7.1 The Far North

The *physical* locus that will be used to test the principles of temporal architecture will be an artist's retreat in Canada's far north. The particular territory was selected for a few reasons. Most importantly, the remote location amplifies and exemplifies the idea of transience, or more specifically, the way a person engages with a built project: for a duration and a purpose. The notion that architecture is an event or occurrence is brought to the forefront of the project *because* of its location. For an individual, just the idea of going on a retreat into the vast northern landscape where they are effectively isolated from their regular life is a major undertaking - and one that won't be forgotten. The act of getting to the site, staying for a while (a week, a month, a season...), producing a project, and then returning to ordinary life all contributes to the *becoming* of the individual; their personal growth, artistic development, and learned experiences. The gravity of an experience like this, and its capacity to affect the people who visit, helps to strengthen the idea of transience in architecture.

A second reason this site was selected was for its ephemeral qualities. What is notable about the far north is the differing qualities of light. The selected site is north of the arctic circle where the average position of the sun is much lower than one may be

used to. More interesting is the seasonal change in daylighting. During the summer solstice, when the north pole is tilted closer to the sun, there exists a duration of about a month when the sun *does not set*. The lands are bathed in sunlight through the entire day and night; one's perception of the evening and night would be thrown off. Similarly, for about a month in winter, there is no sunlight whatsoever. Perpetual darkness would certainly be a shocking experience for anyone not used to the phenomenon. One's sense of time over the short duration of a day would be affected by this - especially from visitors well outside of northern territories.

Similar to how the passing of the seasons is noticeable in the changing colour of leaves as most are used to, the seasons are expressed in the far north as well, despite sparse (or a complete lack of) tree coverage. In the northern regions of the Yukon and the west of the Northwest Territories, the landscape has an abundance of wild grasses and shrubs that change colours with the seasons. What results is a landscape of vast rolling hills of red, orange and yellow. Depending on the length and timing of an artist's visit to the retreat, the drive to and from the building would provide a substantially different experience.

The oscillating shift in weather from seasonal changes results in the character or atmosphere of the landscape to fluctuate from one extreme to the other. In the warm



Figure 36 [top] *The Yukon*, https://farm9.static.flickr.com/8150/6988516956_af7ab021aa_b.jpg
Figure 37 [middle] *Yukon, Canada*, <https://i.pinimg.com/originals/4a/e9/06/4ae906eec92cc7a0ff02e3593f5b2153.jpg>
Figure 38 [bottom] *Ice Shelf*, https://farm8.static.flickr.com/7457/16550361592_4a32a6e572_b.jpg

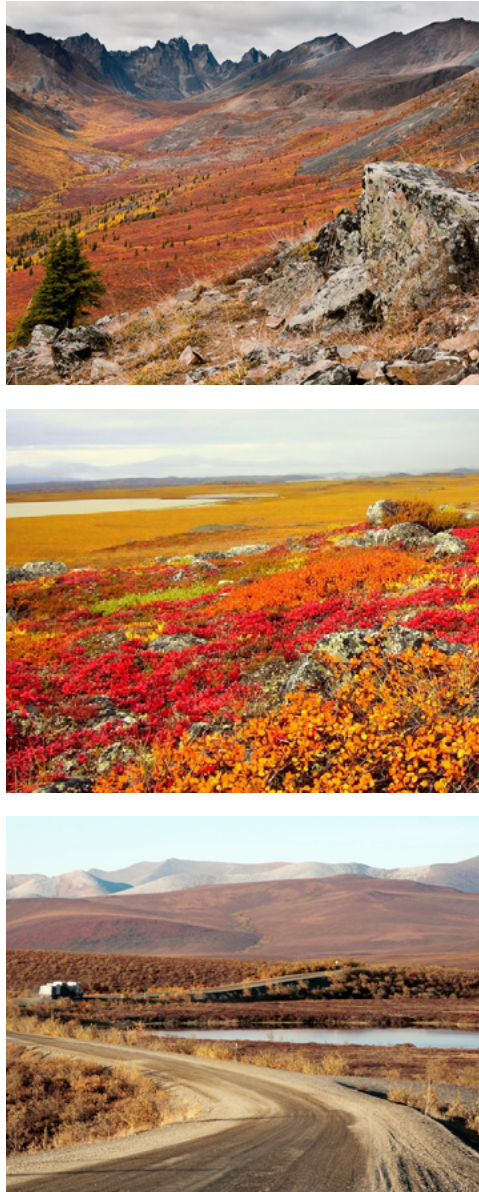


Figure 39 [top] *Grizzly Creek Valley*, <http://images.huffingtonpost.com/2015-07-27-1438037643-2496130-BPTBT8.jpg>
Figure 40 [middle] *Fall on the Tundra*, <http://mapio.net/pic/p-21358343/>
Figure 41 [bottom] *Dempster Highway*, http://farm4.static.flickr.com/3020/2834626587_fd78832f12_b.jpg

summer months, the territory has a quality of serenity: absolute peace and quiet. The vast open nothingness contributes to create an environment ideal to escape the distractions of life, and favour the act of making and thinking. Compare this to the winter months where sunlight is scarce and the frigid temperatures create the necessity for escape and shelter. A residency during the winter compared to the summer would prove to be a vastly differing experience.

Furthering the ephemeral qualities of the territory, the aurora borealis is one unique natural phenomenon for the territory. The occurrence is temporal and coincidental, and provides a magnificent display of light across the northern sky. The northern lights provide another layer of temporal qualities

that contribute to the tranquil character of the territory. The culmination of these characteristics give the selected locus a rich sense of time, providing the ideal context to explore the temporal nature of architecture.

In addition to the first two reasons for selecting this particular location, the site selected was influenced by my own personal attachment to the tundra landscapes that are characteristic of the far north. This interest originated from my travels in the summer of 2016 across Europe which culminated in a full-day drive across the Norwegian landscape from Oslo to the western fjords and back. I had expected the fjords to be beautiful, having seen a plethora of photographs before visiting, but I had no preconceived idea of what the journey to and from the destination

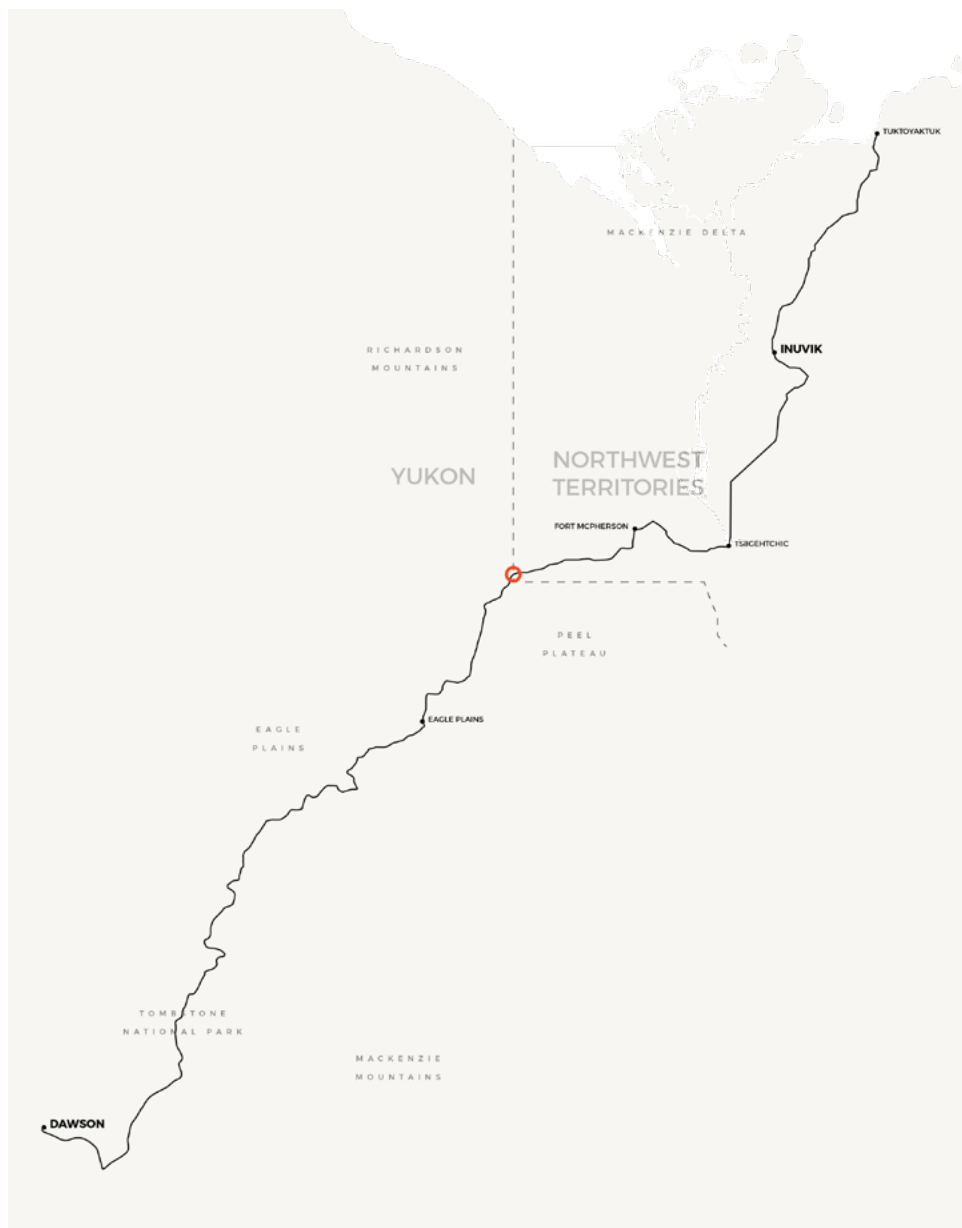


Figure 42 [behind] *Norwegian Far North*, by author

would be like. The tundra-plateau region that I had to pass through caught me off guard; I had never visited a region like that before. The vast expanse of barren rugged terrain was magnificent and deceptive; exploiting one's sense of distance and scale. This enormity evoked in me a humbling appreciation for the landscape, and made me realize just how small we really are. Not only spatially, but temporally as well. However slowly the landscape may change over time, our human existence is but an insignificant blip of time in comparison - the terrain seemed indifferent to my being there. The few instances of buildings that I encountered appeared to be our feeble attempts to persist as long as the mountains do; the wear, weathering and growth of vegetation around these attempts

serve as a reminder of actuality. Needless to say, this experience brought about an interest in the territory, so there was a desire to find a similar place in Canada where people could perhaps have a similar experience of their own.





A project situated in a place like this cannot be solely focused on the architecture itself, but should be mindful of the entire journey involved. The experience one has before, during, and after the visit is all encompassing in the experience of a person's *becoming*. In this way, the artist's retreat becomes a sort of pilgrimage.

and other logistical reasons, there are also more direct routes to the site. 1 hour north, and south, of the site are two small service towns - Eagle Plains and Fort McPherson - with local airstrips where a more direct access to the site is possible.

7.2 A Locus of Pilgrimage

The particular locus selected to explore temporal architecture is on the border of the Yukon and Northwest Territories along the Dempster Highway, a scenic pilgrimage route that is popular for photography and nature expeditions, as well as being the only land route connecting Canada's northern arctic coast with the nation's road network. The site sits in the Richardson mountain range north of the arctic circle and features barren rocky tundra landscapes.

The journey to the site is considerable and would undoubtedly invoke inspiration for actants travelling to the retreat. Given that this retreat is aimed towards the creative people who seek to experience the north in the fullest fashion, the route to access the retreat is treated as a pilgrimage, and part of the whole experience. Actants fly into Dawson City in the Yukon where they will embark on a 9 hour drive up the Dempster Highway to the locus. For supplies, emergencies, visitors,

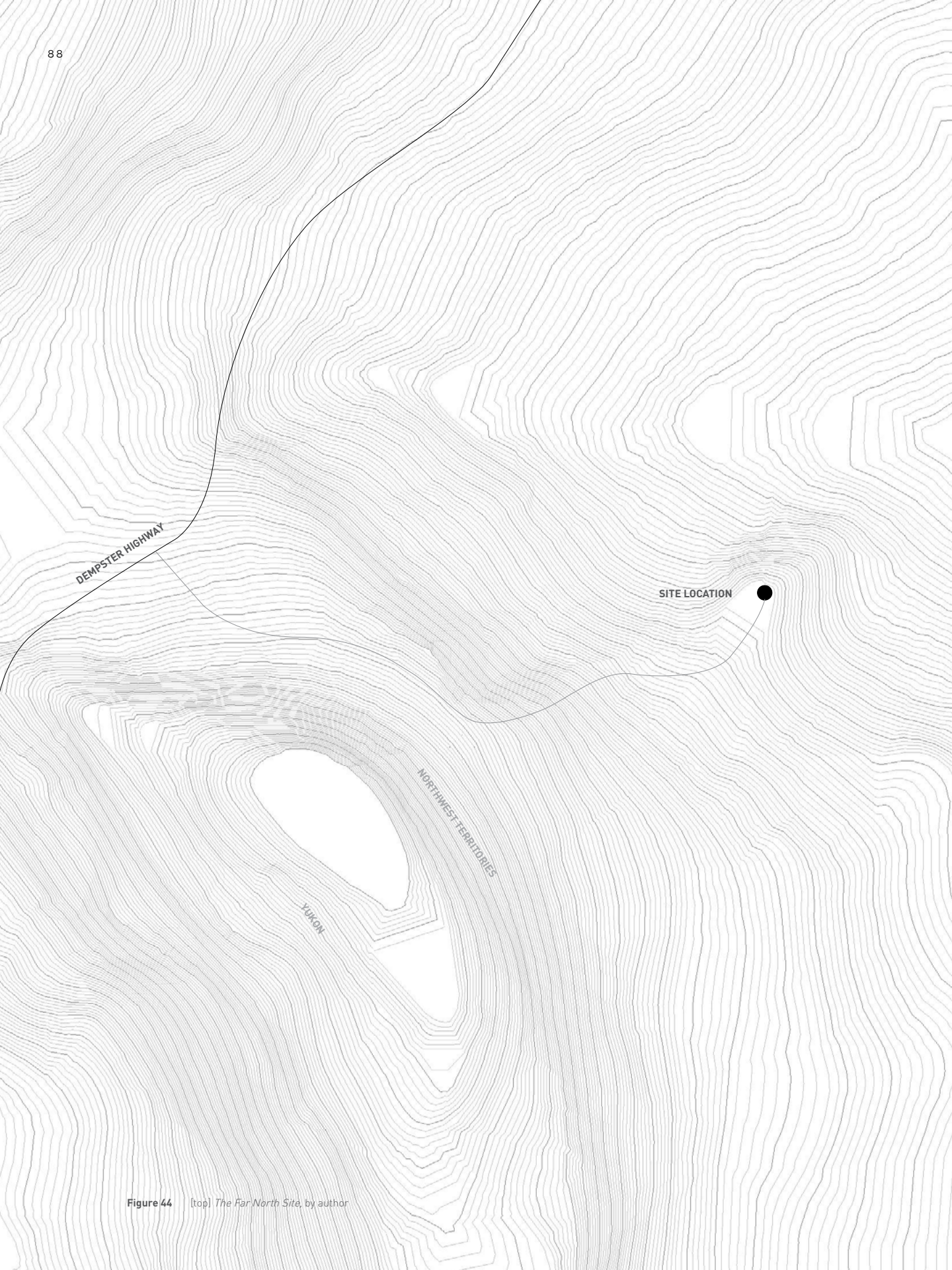


Figure 44 (top) *The Far North Site*, by author

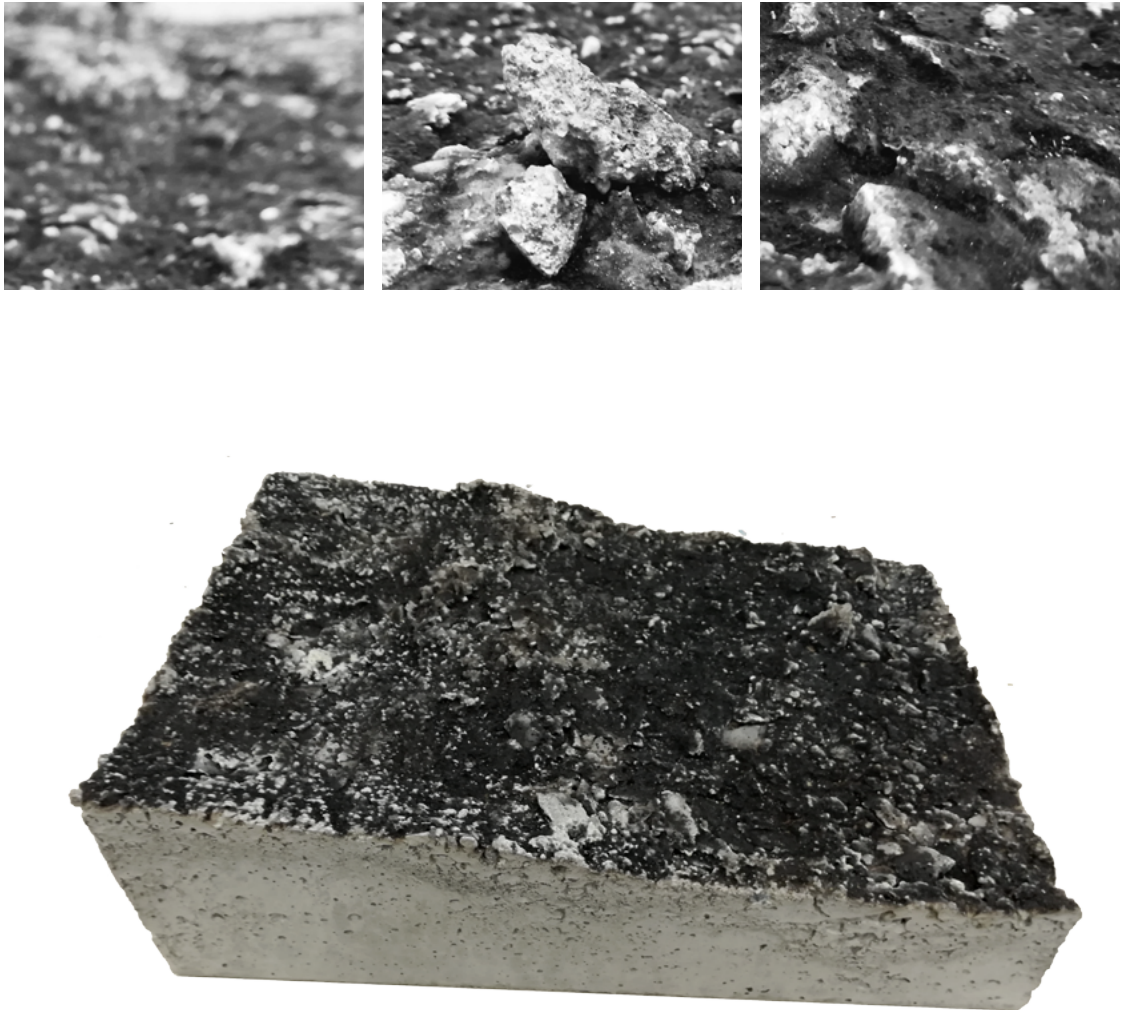


Figure 45 [top] *Site Model Detail*, by author
Figure 46 [bottom] *Site Model*, by author

7.3 A Locus of Making

The project for testing the principles of temporal architecture will be a retreat in the far north. At its core, it functions as a residency program for artists, designers, photographers, musicians, architects, filmmakers, writers, thinkers, etc. that aims to be a place for making, designing, thinking, capturing, and so on. While the specifics of *what* actants may produce is up to the individual, the only requirement for actants is that they produce some form of content, and afterwards exhibit their work in some form. The focus is on *creating* and *sharing*.

The intent of the project draws inspiration from two ideas: the original *Prix de Rome in Architecture* award in Canada that dates back to the mid-1900s, and the *Fogo Island Studios* in Newfoundland. The *Prix de Rome* was for an outstanding emerging architect that awarded them with a year-long residency in Rome, where they were provided with a private studio apartment designed by John Schnier to carry out work on a conceptual project meant to push the boundaries for architectural thinking.³ The award ran in its original form for a few decades, resulting in a number of exceptional theoretical projects. However, it was entirely re-worked into an award of recognition that remains today, where the retreat aspect has been stripped.⁴ The proposed thesis project can be seen as

a spiritual successor to the *Prix de Rome* prize in its original form, however expanded in scale and in discipline.

The *Fogo Island Studios* by Saunders Architecture also provides inspiration for the thesis project's intentions. That project is a series of artist studios spread across Fogo Island that house residencies for artists, designers, thinkers and so on. Each studio is isolated and strikingly situated among the rugged, rocky terrain of the island's coast. The Fogo Island Inn serves as the centre for the project where artists can exhibit their work in the gallery, and provides an inn for visitors to experience the art and landscape.⁵

The idea of a remote locus for making, innovating and designing is the main takeaway from each example. For this project, it also has a collaborative element; each actant is provided with a modest live-work space for their own privacy, but all other spaces are shared between other actants. The number of actants residing in the locus varies and changes over time, but is intended to remain quite low - the intent is for a serene, isolated type of atmosphere rather than a bustling hub of activity - so the project initially proposes only 4 live-work spaces. The cross-disciplinary objective creates opportunities for ideas to be spread and shared that may not regularly happen. For instance, a fiction writer, a jazz musician, an abstract artist, an architecture graduate, and a sculptor under one roof for



a season would provide a unique perspective for each involved, potentially broadening the potential for their work. After all, broadening one's perspective and searching for a unique experience would be among the top reasons for an individual to decide to leave their life behind for a few months and embark on this journey. The locus is ideal for those searching for a unique place to produce work that could potentially change the way they approach their craft. The actant is searching for some form of *personal becoming*.

NOTES

- 1 "Oxford Dictionary," Oxford University Press, n.d., <https://en.oxforddictionaries.com/>.
- 2 Ibid.
- 3 Marco Polo, *The Prix de Rome in Architecture: A Retrospective* (Coach House Books, 2002).
- 4 Ibid.
- 5 Jonathan Bell and Ellie Stathaki, *Todd Saunders: Architecture in Northern Landscapes* (Basel: Birkhauser, 2012).

8

FORMATION

The core of the critique in this thesis is of the misconception that architecture - and, by extension, nature - is static and deterministic. The ideal of permanence is a large component of what architecture is historically based on, and the desire for timelessness in architecture still exists today. As we know, no physical object is situated beyond time. These ideals consider the aspects of *matter* and *space* in architecture, but we know these cannot be separated from *energy* and *time*. The principle of temporal architecture, *formation*, involves looking at the tangible, material aspects of architecture with the framework of *energy* and *time* that has been developed through this thesis.

Using the specific term *formation* instead of form is a method of implying that material form has an embedded history of process, and is continually being refined, adding to its history. *Formation* implies a 'coming together' of material, or the act of creation, whereas architectural *form* suggests a more empirical understanding of substance which is devoid of time. A *Formation* typically refers to the natural landscape, such as the formation of a valley,

or a rock outcropping. When thinking about natural formation, we understand it to involve the process of weathering, wear, growth and death, erosion, and so on, that has produced the resultant landscape. *Architectural formation* carries similar implications; it too is subject to natural processes of energy flow which shape and influence the material that constitutes a structure. However, one fairly obvious distinction between a natural and architectural formation is that landscapes are shaped by natural processes over billions of years, whereas architectural formations are constructed. The act of constructing is seen as another form of energy transformation where the designer and builder have agency. The processes of energy in architecture are not simply the passive effects of weathering, but the active involvement of *making*. This gives the project's status of a 'locus of making' a dual meaning; it is a container for the act of making, and is an act of making *itself*.

This viewpoint draws influence from thermodynamics and specifically its first law of energy transformation and continuation. The idea that energy is perpetually transforming itself from one system to another, coupled with Kiel Moe's idea that matter is captured energy, draws the concern for *formation* towards a tectonics of *time* and *energy*. With *Temporal Tectonics*, we can view the construction of architecture as a thermodynamic energy process. It is a

dynamic act of bringing material together into the *locus*, where it becomes an active part of the assemblage, for a time. This material oriented approach to architecture lends itself to a detail-focused design method, where detailing acts as the driver for the formation of a project.

8.1 Design Formation

When viewing the tangible aspects of architecture under the framework of thermodynamics, the *formation* of architecture cannot be seen as a singular act that occurs before occupation, but rather as a continual circumstance that is perpetual. The *locus* is always forming. As such, the process of designing architecture is ongoing. This presents an alternative approach to the relationship between the architect and architecture, as well as between the drawing and the built work. A traditional linear design process would see sketches, models, drawings, etc. produced through the process of schematic design and design development, the production of construction documents, procurement, construction, and take-over. In this model (and other models of project delivery) we see a set duration where drawings are utilized and a set time where the architect is involved. With temporal architecture, the linear process is questioned, and instead allows us to speculate on the potential future

roles of the architect and the drawing where design, construction and occupation are all intertwined.

In reference to chapter 4, the act of making is where the 'becoming' of the designer occurs. Similarly, for temporal architecture, the relationship between architecture and the architect could become deeper. Presently, the architect is often detached from the built work, occupying the realm of the drawing and digital world, but rarely engaging the tangible realization of their work. Temporal architecture imagines the architect experiencing the work first hand, designing the project from within.

people in the locus as active *actants*, we can understand material to be an *actant* in the formation of architecture as well.

8.2 Temporal Tectonics

As mentioned, in order to bring considerations of *time* and *energy* into architectural tectonics, we can view construction as a process of energy transformation, effectively applying the implications of thermodynamics to the tangible aspects of architecture. With this, tectonics is elevated from the joining of material to also include material's behaviour over time. The material brought into the *locus* is entering a thermodynamic system where it is among the forms of energy that constitute the milieu of the locus. As we know, the energy in a system is constantly flowing, interacting and transforming within itself, and with its context. Just like we see the flow of

DETAIL DRIVER

A detail parti consisting of four squares arranged around a cross-shaped void



ESTABLISH CORE GRID

The detail creates the origin of a simple grid to carry the geometric logic through the project



HEARTH AT CORE

The hearth at the core exemplifies energy flow, and draws inspiration from traditional igloo design.



STRUCTURAL ORDER

Primary structural wood posts frame the hearth



ESTABLISH SPACE

The posts define a space around the hearth



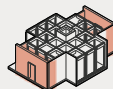
EXPRESSIVE STRUCTURE

The post and beam structure is expressive of the core detail



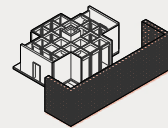
THRESHOLD SPACE

Threshold spaces direct views and circulation towards the heart of the space: the fireplace



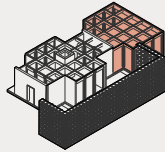
WOOD LATTICE STRUCTURE

A wood lattice creates a containment of space



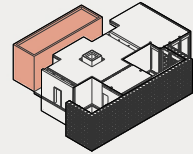
ADJACENT WORKSPACE

A large workspace extends beyond the lattice, and repeats the structural grid from the core



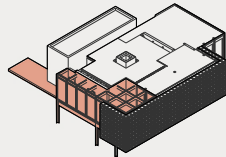
SUPPORTING SPACE

Supporting spaces are provided in the rear



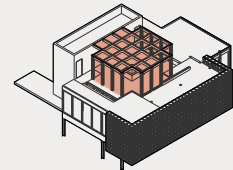
WORK SPACES & CIRCULATION

Smaller, more intimate work spaces fill the void between the lattice and the core space



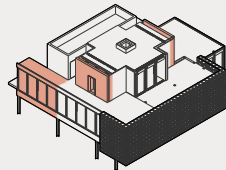
VERTICAL EXPANSION

The design extends the core hearth vertically



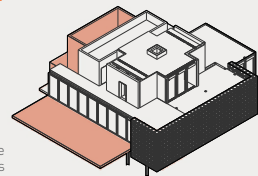
THRESHOLDS

The thresholds provide a heightened sense of importance for the core space



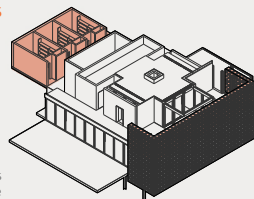
EXTERIOR TERRACE & EXPANDED SUPPORT

An exterior terrace improves the projects relationship with its context



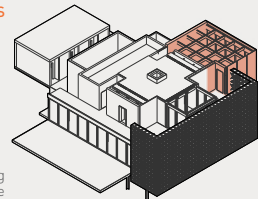
PRIVATE STUDIOS

A 'back wing' is established where private sleeping rooms double as quiet studios.



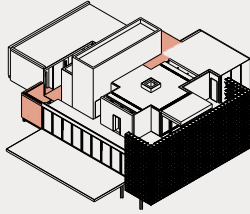
KITCHEN & LIVING SPACES

Adjacent to the rear wing are kitchen and lounge spaces, together forming the area dedicated to living and comfort

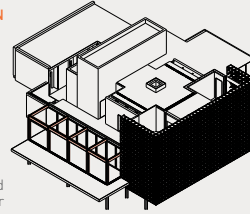


CIRCULATION

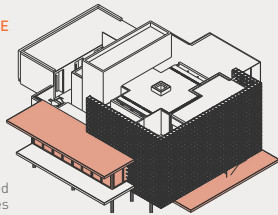
Vertical circulation connects the staggered floorplates

**LATTICE EXPANSION**

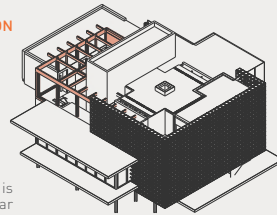
The lattice is extended vertically to further contain expansion

**ENTRANCE EXHIBIT SPACE**

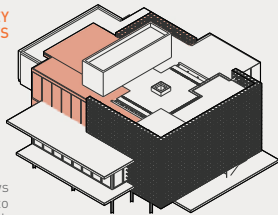
A south wing is created with bright open spaces which act as an entrance, meet and exhibit space

**STRUCTURAL EXPANSION**

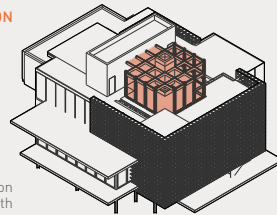
The structural logic is extended above the rear wing

**CIRCULATION & CLERESTORY WINDOWS**

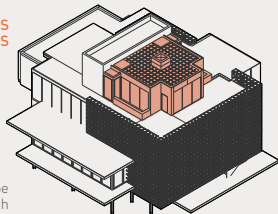
Clerestory windows allow natural light to enter the otherwise dark and closed off areas in the centre of the project

**VERTICAL EXPANSION**

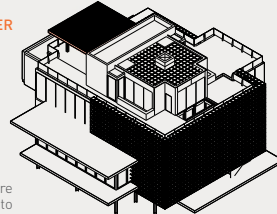
Vertical expansion continues the hearth and its core spaces to a third floor

**ENVELOPE THAT PRIVILEGES VIEWS**

The top floor envelope privileges views with an abundance of transparency

**ROOFTOP SHELTER**

Rooftop terraces are given a weather shelter to increase their usage and comfort



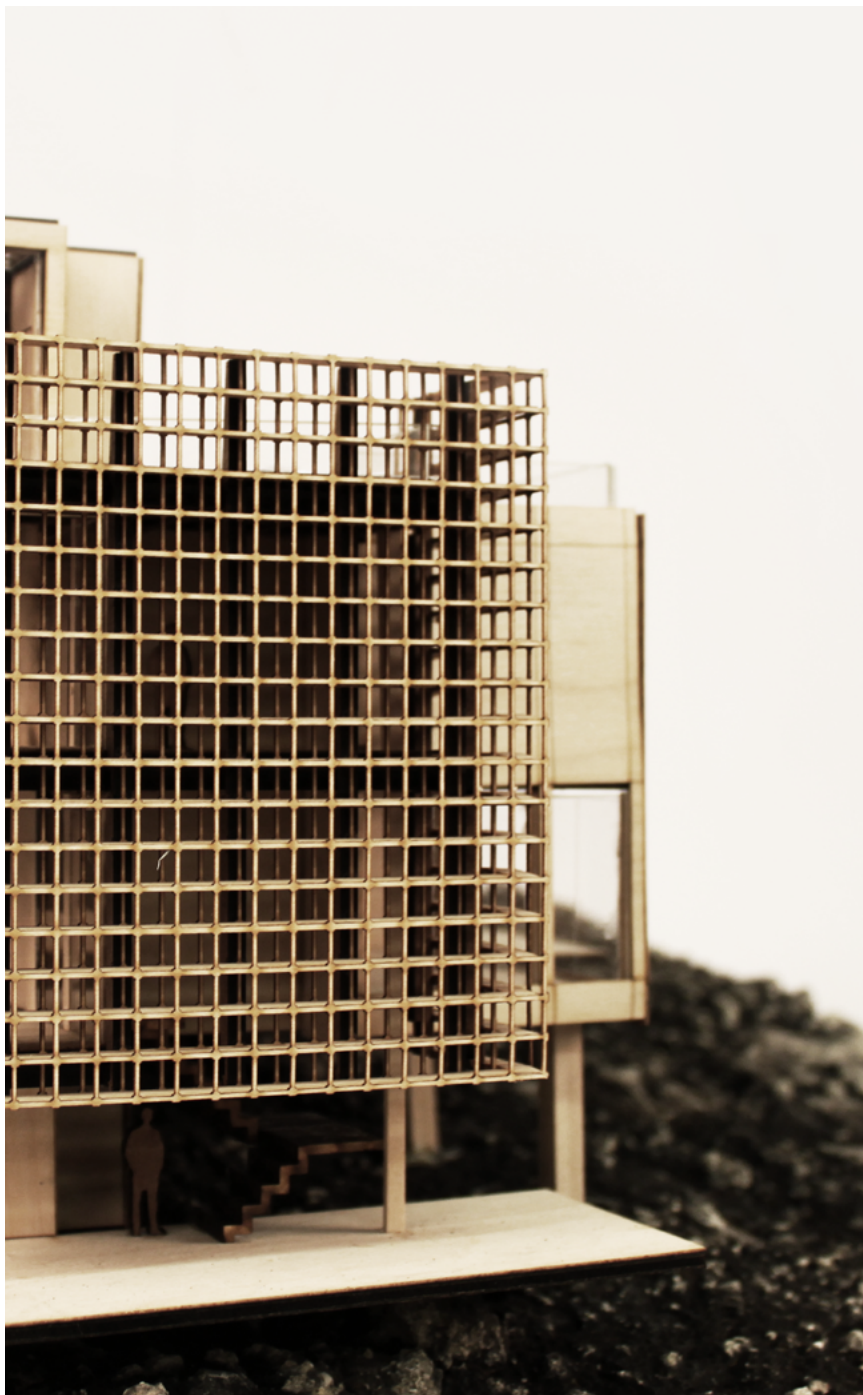


Figure 49 [above] *Project Model*, by author

8.2.1 The Detail

For formation, the detail is of paramount significance as it is an architectural means of illustrating process. As discussed in previous chapters, the resultant forms that we observe in the world are manifestations of processes of energy flow. For architecture, the detail is revealing of the act of construction - it is inherently temporal. It is through the detail that all of the material that enters into the locus interacts, for a duration. Therefore, the detail serves as architecture's language for its formation and continued process of becoming.

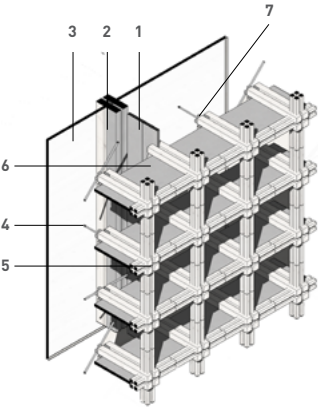
The second law of thermodynamics, the increase of entropy, coupled with the nonequilibrium concept of dissipative structures articulates the natural tendency for creation in the world. While this is directly applicable to natural evolution, ecology and biology, it has been theoretically tied to many other aspects of the world - tangible and intangible. Erin Schneider and Dorion Sagan tie nonequilibrium thermodynamics to economics;¹ Michael Weinstock equates the concepts to civilization;² Luis Fernandez-Galiano ties it to information, genetics, and embodied 'energy';^{3 4} and Kiel Moe ties it to architecture.⁵ Architecture's temporal nature, including its tangible and intangible aspects, exhibit the same natural tendency for continual elaboration and perpetual

newness. This tendency is realized through the architectural detail.

The detail is elevated to be the driver of formation. In the spirit of form follows flow, the flow of material seen here is manifested with joinery in the act of construction. A detail-before-geometry approach allows for the locus to take a form that allows for perpetual creation. For the project herein, the current design iteration resulted from a search for a core detail to inform the formation of the project. Previous iterations contained a number of details that would drive their respective portion of the design, however it was decided that a single core detail is more effective in driving the narrative of the project's formation, providing greater flexibility and cohesion.

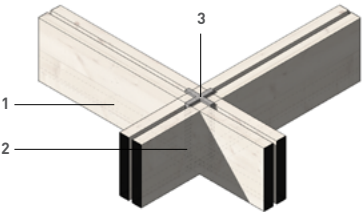
Figure 50 [top] *DE-01 Veil Detail*, by author
Figure 51 [middle] *DE-02 beam connection*, by author
Figure 52 [bottom] *DE-03 column-floor assembly*, by author

- 1 Steel channel, fastened at slab edge
- 2 Wood mullion with bronze cap
- 3 Triple pane glazing
- 4 Structural steel cable diagrid
- 5 Wood lattice
- 6 Bronze louvre
- 7 Cable - lattice fastener



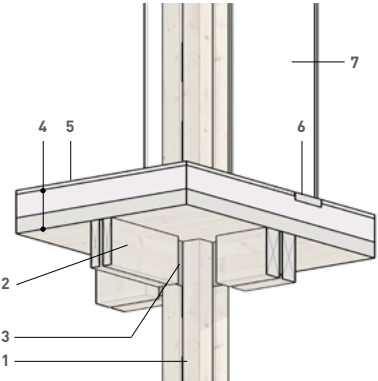
DE-01 veil detail

- 1 Glulam beam
- 2 Lap joint
- 3 Bronze stabilizing bracket



DE-02 beam connection

- 1 Quad steel angle column with wood post surround
- 2 Glulam beam
- 3 Steel bracket connection
- 4 Cross-laminated timber floor panel
- 5 Rigid insulation with floor support battens
- 6 Panelized tongue and groove flooring
- 7 Window frame set into flooring
- 8 Triple pane glazing



DE-03 column-floor assembly

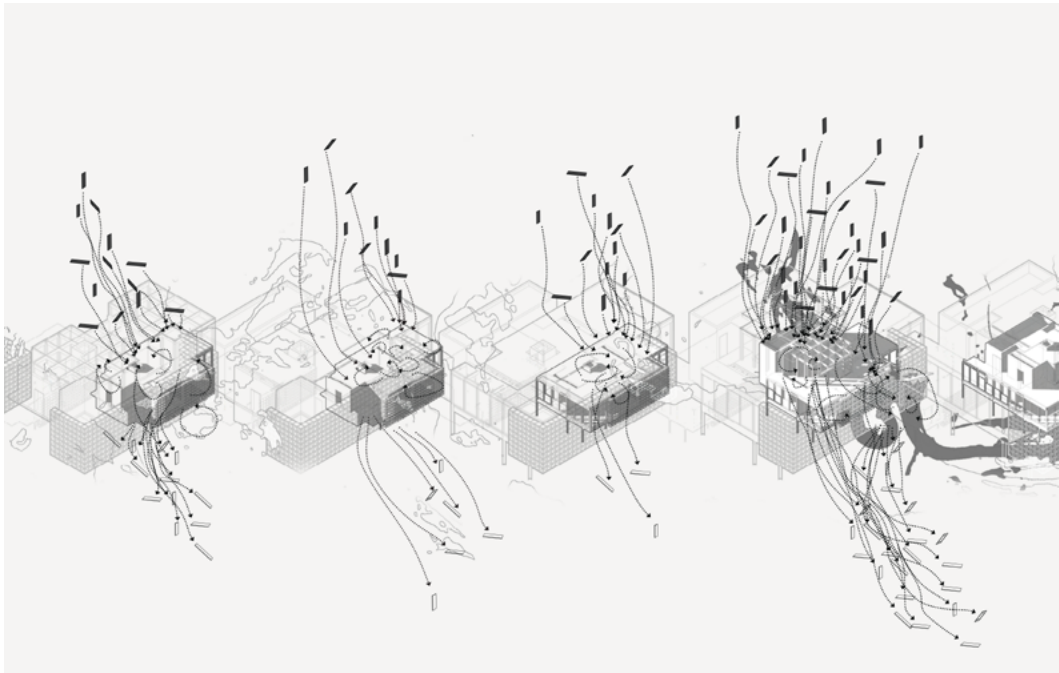


Figure 53 *Locus of Material*, by author

8.2.2 A Locus of Material

The thesis aims to look at architecture as a locus of material. Like a thermodynamic system, the locus has no absolute, deterministic state but is rather in a state of continuous articulation. As such, the project is examined and designed as a system that continuously unfolds; the state that the project is in is but one momentary instance in the project's actuality.

To allow for the project's gradual formation, the building is assembled from prefabricated elements and components. These objects bring the concept of tempo and objectile into an architectural assembly. Through these elements, the architecture is allowed to continuously unfold as the flows of energy and matter influence change in the system. With the addition and articulation of individual parts, the overall project experiences a constant rate of change, where no final form exists, but it remains in constant flux. In many ways, the behaviour of material flux in architecture echoes Ilya Prigogine's idea of the dissipative structure. When observed from the outside, the system appears to be in a relatively stable state, however its complexion of matter and energy is constantly renewing itself through an inflow and outflow of substance over the course of its life.

Through the constant amplification and dissipation of energy and matter in the locus,

the project persists as a temporal form that continuously fluctuates. With the influx and outflow of material, the architectural assemblage evokes Prigogine's idea of the dissipative structure, where the overall form is defined by the flows of energy through it, and maintains itself in a relatively stable state far from equilibrium.

From the pulsing of energy emerges a particular order for a particular time. Over time, the project continuously evolves to the needs of the next wave of people using it, always building off the processes from the previous state.

For this project, any physical additions are not necessarily compartments 'slotted in' to a rigid framework. That type of hierarchical system is seen in projects that aim to allow for change, such as Kisho Kurokawa's Nagakin Capsule Tower, the realization of Japanese Metabolist architecture.⁶ Here the supposed flexibility offered by the capsules is limited by the rigidity of the frame, thus it can never achieve its goal of offering change as the world around it changes. For the formation of this project, the framework is not physical, but ideal, and is found in the detail. The detail provides the logic and order for future change, and does not physically impede the potential of future formation; it is not hierarchical or dictating.

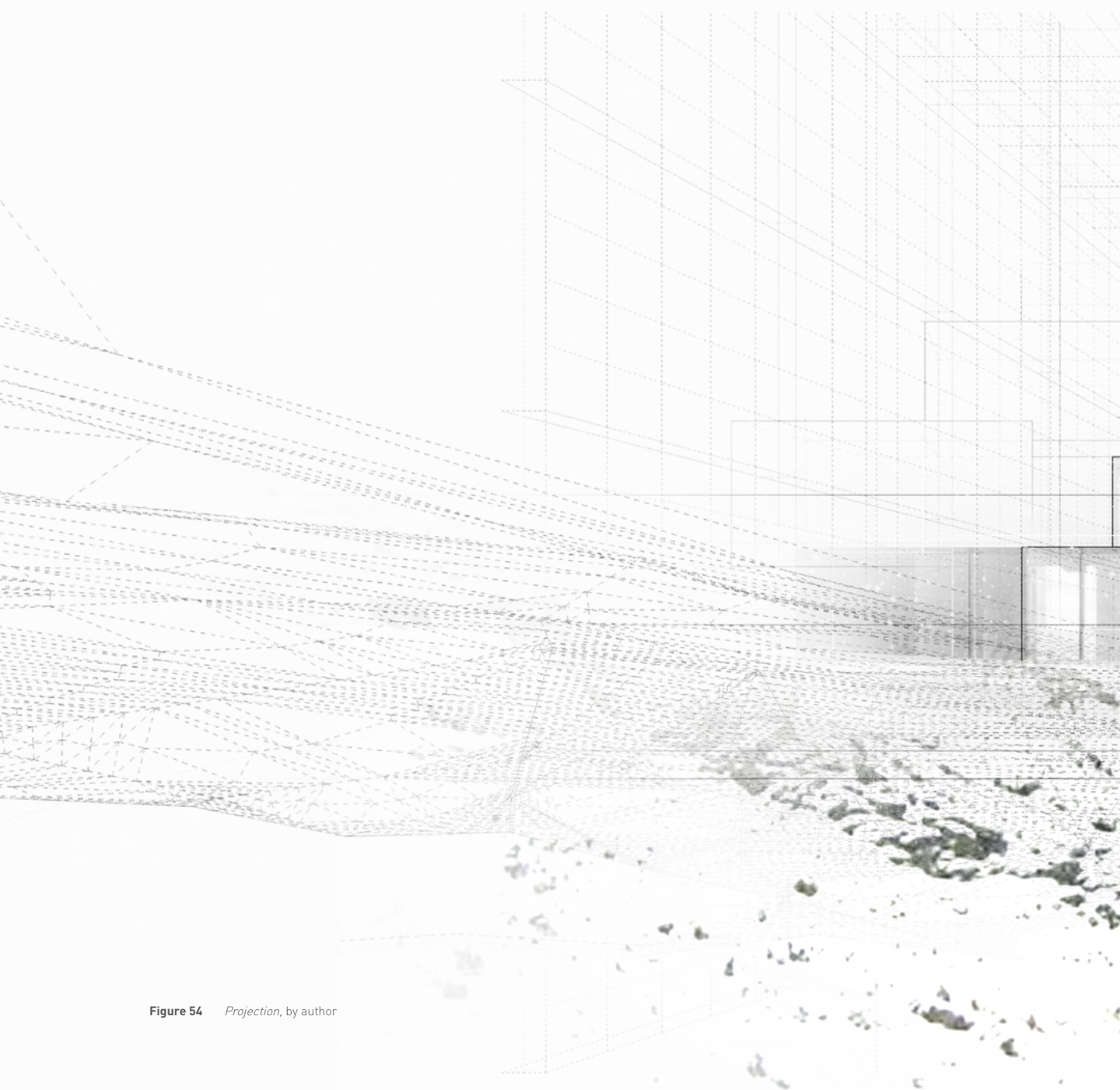
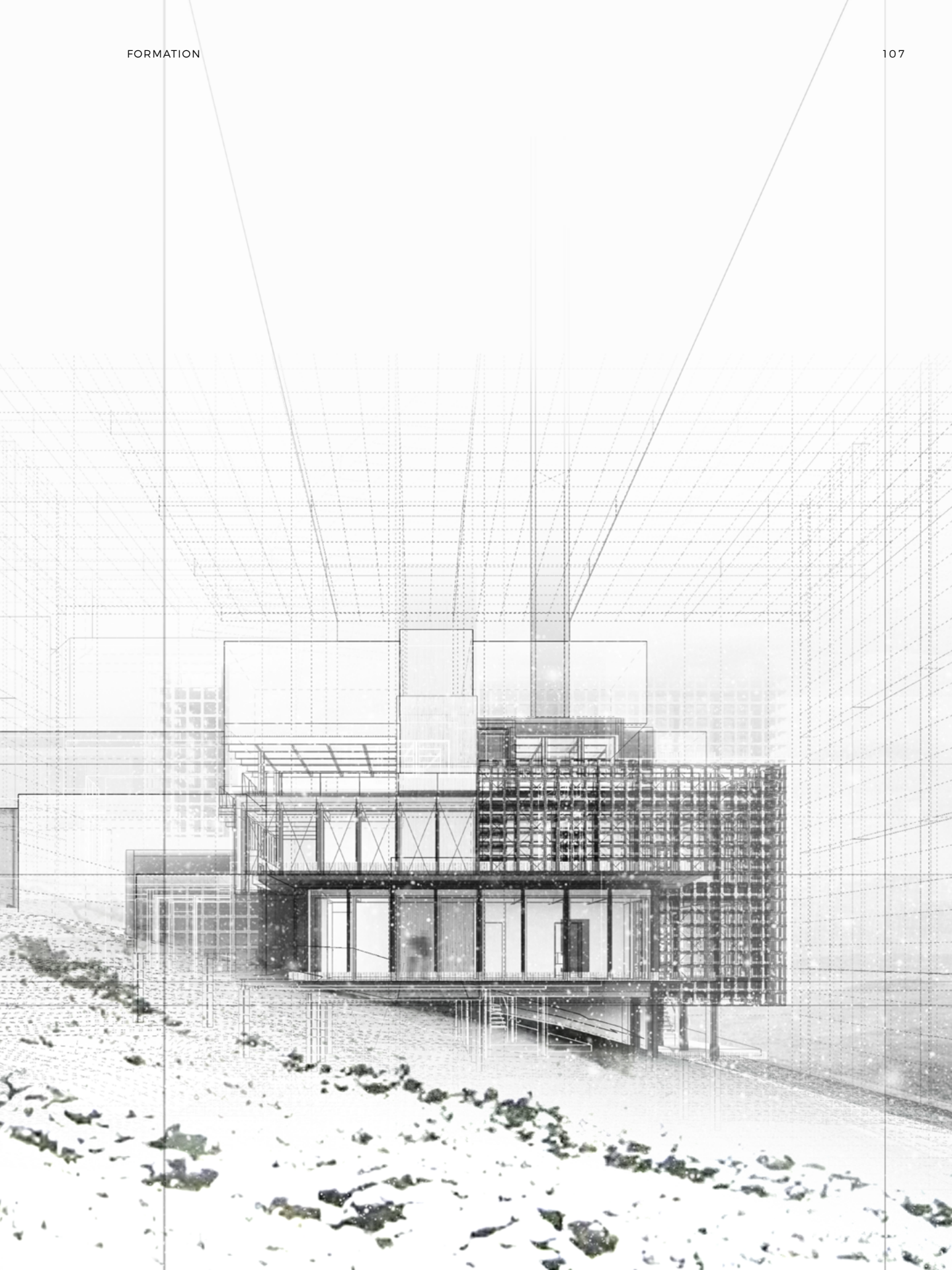


Figure 54 *Projection, by author*



8.2.3 Energy Processes

For temporal tectonics, the effects of energy processes are seen over time through material decay and weathering; physical properties change over time, chemical reactions may occur, and so on. Energy processes are also prevalent in the formation or construction of architecture. Weathering is a form of energy and material transformation and processes. The sculpting of the landscape is the work of weathering, for instance. The atmospheric effects of light, heat, moisture, wind, etc. are responsible for its ongoing formation. In this light, the effects of energy processes are seen as a becoming, rather than detrimental to the ideal. David Leatherbarrow views these effects as a positive that “bring the project closer to a condition of actuality based on its potential transformations through time.”⁷ The patina colour on metals that changes over time from oxidization, the weathering of wood from exposure to sunlight and moisture, and the stains of water on stone are a few ways that the flow of energy paints its effects on material in artful ways; leaving behind a tracing of energy processes. Leatherbarrow is critical of the notion that these effects detract from the intended architectural design. “The duration that is to follow the completion of a building - the life of the building - is conceived as a subtraction from the ideal condition of the project realized before inhabitation and

weathering. It is in this sense that staining and erosion can be seen as an antithesis to the ideality of the project.”⁸ He instead aims to see “the unending deterioration of a finish that results from weather [as] the continuous metamorphosis of the building itself, as part of its beginnings and its ever-changing ‘finish’.”⁹ Similar to Leatherbarrow, Juhani Pallasmaa is critical of mutable, flat walls that favour formal purity over any sense of tectonics or matter. Whiteness, as he calls it, expels a sense of temporality from architecture. “as a consequence of its formal ideals, the architecture of our time is usually creating settings for the eye which seem to originate in a single moment of time and evoke the experience of flattened temporality.”¹⁰ This approach deals with the architectural object as an “artifact that exists in a timeless space, an artificial condition separated from the reality of time.”¹¹

Peter Zumthor creatively displays the effects of sunlight on wood in the Saint Benedict Chapel project in Sumvitg, Switzerland. Zumthor uses traditional wood shingles to clad the curvilinear walls of the chapel; one face with northern exposure, the other faces south. What results is a dual toned expression: the north facing shingles have silvered as they age, while the south facing shingles have blackened from direct sunlight exposure. In a simple but effective manner, the chapel is expressive of the varying effects

energy can have on material, and displays a sense of temporality.



Figure 55 *Chapel Sumvitg, Peter Zumthor*

NOTES

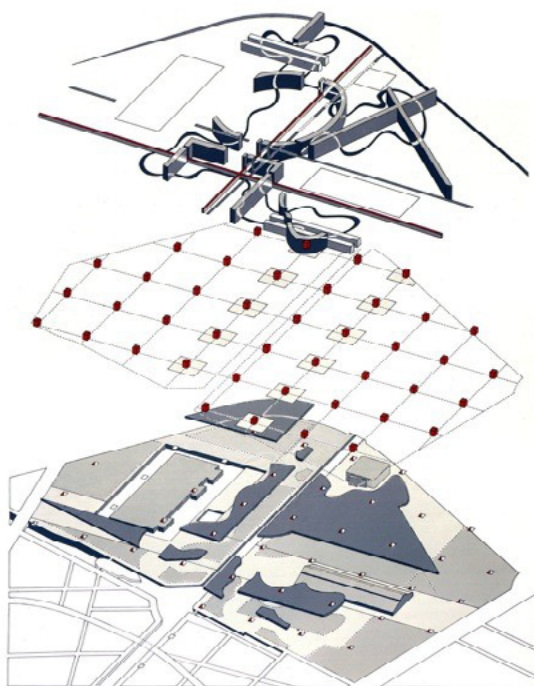
- 1 Eric Schneider and Dorion Sagan, *Into the Cool: Energy Flow, Thermodynamics, and Life* (The University of Chicago Press, 2005).
- 2 Weinstock, *The Architecture of Emergence: The Evolution of Form in Nature and Civilisation*.
- 3 Fernández-Galiano, *Fire and Memory: On Architecture and Energy*.
- 4 Refers to embodied energy being knowledge embedded in an individual, not the building science understanding of the term.
- 5 Moe, *Insulating Modernism: Isolated and Non-Isolated Thermodynamics in Architecture*.
- 6 Sola-Morales, "Liquid Architecture," 38.
- 7 David Leatherbarrow and Mohsen Mostafavi, *On Weathering: The Life of Buildings in Time* (The MIT Press, 1993), 112.
- 8 Ibid., 64.
- 9 Ibid., 16.
- 10 Juhani Pallasmaa, "Hapticity and Time: Notes on Fragile Architecture," 2000, 2.
- 11 Ibid.

9

TRANSIENCE

Transience in architecture is not the design of temporary structures, wherein the prime concern is often the structure's end of life disassembly; temporary architecture does not leave a trace of its existence. This approach tends to ignore fundamental aspects of architecture that aim towards comfort, functionality and beauty. Temporary projects often *look* temporary, which can elicit a negative reaction from people where the space is not respected or inhabited.

Transient architecture, on the other hand, learns from the conceptual approach to degradation found in the ways that temporal systems combat entropy. It tells us that the constant force of creating, making and innovating gives architecture its temporality. Transient architecture isn't concerned with its end life, but rather, it's constant drive forwards. Over the course of its duration, it slowly transforms culturally to the degree that the totality of what constitutes the project cannot be captured in one particular moment of its evolution. Instead, to reference Bernard Tschumi, architecture is a long-term occurrence that consists of many different



events, happenings and changes through its existence.¹

The proposed artist's retreat in the north serves as a vehicle for testing the idea of transience in architecture. Its remote location, plus the active program of creating and designing, serve to heighten the project's capacity to evoke transience in architecture. The *culture* of the project - culture being defined as the collective of human intellectual and creative achievement - or its identity and soul, is a manifestation of all the artworks, stories, and occurrences that take place. The culture of the project is not a self-contained thing, nor is it definitive. It is the locus of all activity of its actants. Due to the fact that actants come and go, there will never be the same group of people within its walls more than once. The collective identity of the project, therefore, transforms and morphs with the actants that define it. What may be seen as a centre for landscape oriented photography and art in one year may become a locus for writers a few years later, and perhaps a favoured recording space for musicians after that. The way the project is understood will change quite rapidly, and is further reinforced from the artworks, stories and experiences that actants bring back home with them after leaving, and the new grouping of actants who inherit the space for the next duration. What results is a place that is always discovering itself culturally, and being discovered by the

individual. It never ceases in its unfolding and becoming-ever-different.

9.1 Architecture as Event

What becomes critical for an architecture of transience is the relationship between architecture, the physical object, and the events and activity that define the project. Architecture that is concerned with activity, *event architecture*, views that relationship as inseparable, as best stated by Bernard Tschumi.² Through the better part of his career, Tschumi has concerned himself with ideas of the event and program. To Tschumi, "there is no space without event, no architecture without program."³ The event, which he defines as activities and occurrences, cannot be separated from the architecture that contains it. Program, he says, can then be understood as a collection of events.⁴ The traditional view of architecture as a passive container for activity forms a major component of his critique. Instead, he understands space to be intrinsically linked to movement, action and dynamics.⁵ He explores these ideas in a number of projects, most notably in the conceptual work *The Manhattan Transcripts* and his built project *Parc de La Villette*.

The *Manhattan Transcripts* [Figure 57] are a series of conceptual architectural representations that depict events and

Figure 56 [opposite] *Parc de la Villette*, Bernard Tschumi, 1987 https://images.adsttc.com/media/images/5037/f5b2/28ba/0d59/9b00/0691/medium_jpg/stringio.jpg?1414206303

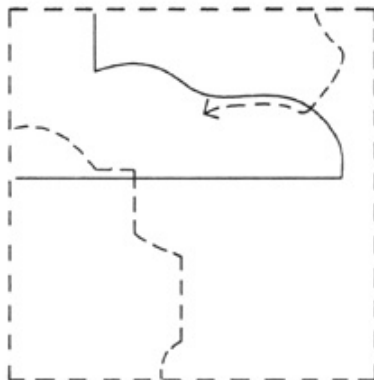
activities in a particular space. What is evident is that this project is an investigation of not only event architecture, but representational techniques as well. Tschumi uses a strict representational language to convey a short narrative. Each moment in the narrative is depicted using three frames: one focused on the object and physical space, one focused on the character, and one a diagram of movement or action. These three frames cannot be understood separately - they complement one another in creating an understanding of space. One story shows the movement of a murderer and a victim through Central Park; another is located on the street; and a third within a series of rooms.⁶

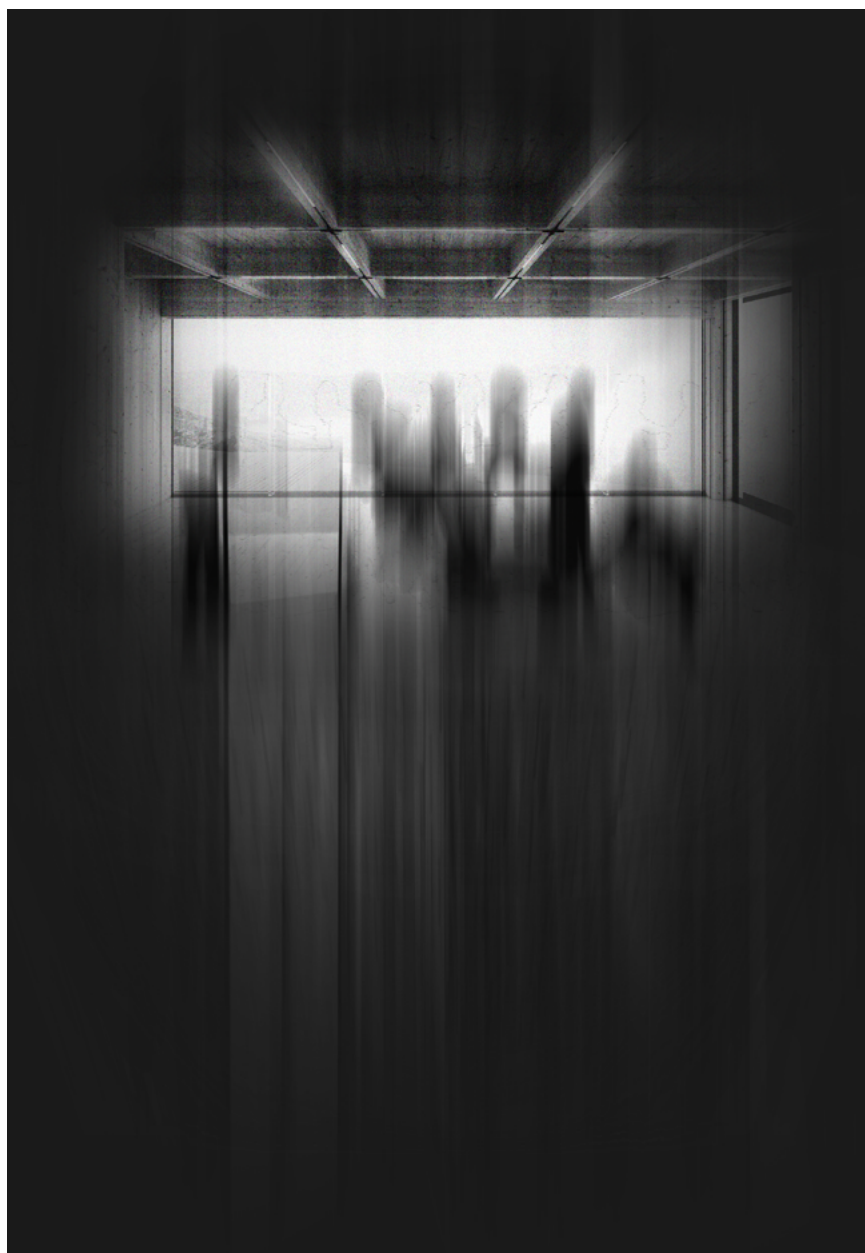
One of Tschumi's most well-known built works was for a competition to reimagine the Parc de La Villette in Paris **[Figure 56]**. His underlying conception for the public space was not focused on creating a piece of landscape - it was focused on culture and human interaction.⁷ Here we see again his idea of event architecture. The design consists of 3 layered motifs of points, lines and surfaces. The points are organized into a grid overlaid onto the site where each is demarcated by what he calls a *folie*. These follies are iconic red structures that are seen as "building-generators of events" that engage in the cultural transformation of the surrounding neighborhoods "as much through their programs as through their spatial potential."⁸

Tschumi's architecture strategically aims to create activity and interaction through these interventions, which embody his ideas of event architecture.

For this thesis project, Transient architecture employs a series of contingent spaces that are intended to be used as working studio spaces for the resident artists. These spaces provide the bare minimum - often a work surface, shelving, and enough space for actants to comfortably engage in their work. There are larger areas that would be ideal for the creation of physical objects, be it fabrication, sculpting, industrial design, or a large art piece. There are also smaller nooks and alcoves scattered around the project for those who prefer a cozy corner to settle into to do some reading and writing. The intent of the spaces is not to dictate activity, but allow for actants to make the spaces their own, so to speak. For the duration of one's stay, an actant may choose to 'claim' one studio (there are, after all, plenty of spaces to choose from). They would leave their materials there, perhaps pin up ideas, and generally move into the space, where through the act of making for a duration, they may grow an attachment to the space. Their work, the ideas created, and the experience had, all become associated with the room they claimed as their own. In other words, the *event* and the *space* become intrinsically linked.

This strategy learns from Tschumi's event-





space follies, and Cedric Price's dynamically changing spaces in how the rooms become transient, and encourage activity. The personal attachment that may develop during an actant's time in the residency may then be manifested in the work and stories that they share, as well as in the exhibition and library spaces which preserve a collection of produced works, and perhaps in physical traces of their production that they leave behind in the space - scratches in the desk, the walls, or work left behind for others to see. In any of these scenarios, the story - or culture - that was created from any actants experienced is then associated with the space, and added to the ongoing history that actants are developing through their own act of making.

What gives these spaces, and the project as a whole, its character is the succession of activity that occurs over the longer term **[Figure 58]**. Every time an actant comes to stay at the retreat, they are inheriting what was created from the previous group of actants. Even more, whichever space they claim as their own comes with it a history of succession with layers of evidence. Spaces become associated with stories, and experience a *becoming* of their own; these spaces are the locus of their respective stories.

[illegible]



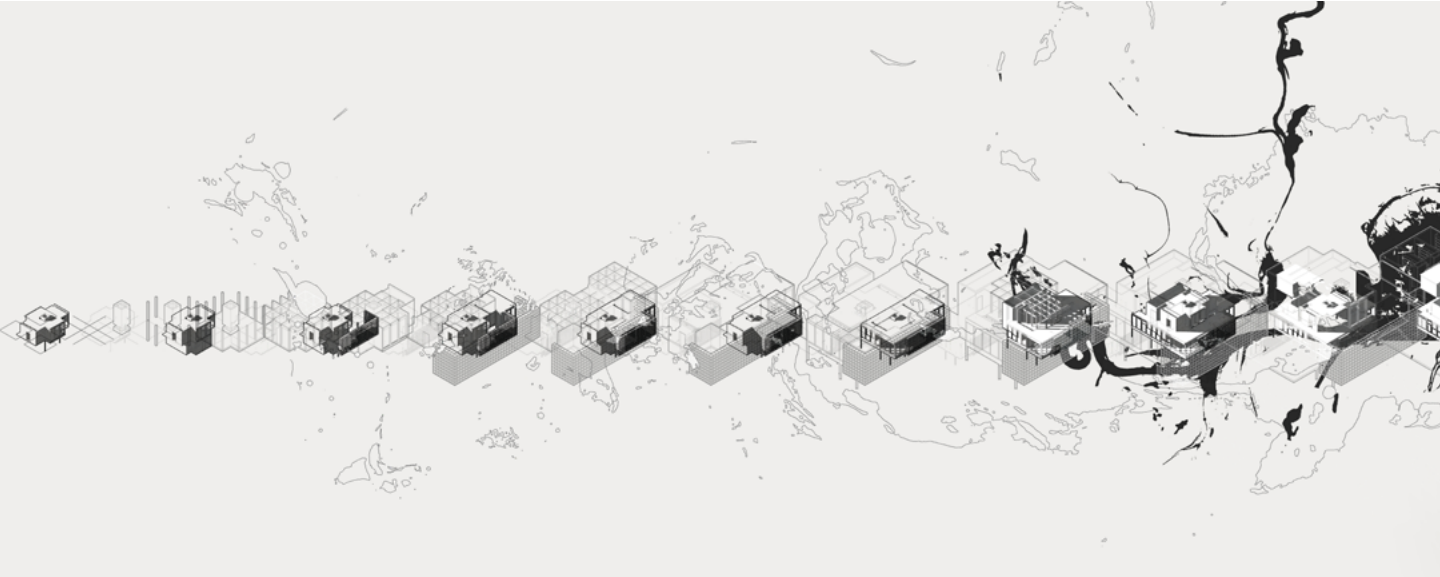
NOTES

- 1 Bernard Tschumi, *The Manhattan Transcripts* (Academy Group Ltd, 1994), 8.
- 2 Tschumi, *The Manhattan Transcripts*.
- 3 Tschumi, *Architecture and Disjunction*, 139.
- 4 Tschumi, *The Manhattan Transcripts*, 8.
- 5 Giovanni Damiani and K Michael Hays, *Bernard Tschumi* (London: Thames & Hudson Ltd, 2003), 19.
- 6 Tschumi, *The Manhattan Transcripts*.
- 7 Damiani and Hays, *Bernard Tschumi*, 42.
- 8 Ibid., 49.

10

TOWARDS A TEMPORAL ARCHITECTURE

This body of work, in a way, is a rise to Bruno Latour's challenge for architects to grasp the 'flight' of the building, as he states: "we need an artificial device (a theory in this case) in order to be able to transform the static view of a building into one that could at last document the continuous flow that a building always is."¹ The process of working towards a *temporal* architecture is, as I had come to realize, more about looking at architecture in a particular way; understanding its temporal nature, and developing an approach to architecture. We have broken architecture down to its tangible and intangible qualities which are understood through the principles of *formation* and *transience* respectively. When understood together, each concept – the continuous realization of form, and the successive transient occurrences – together form the central thesis concept of *becoming*. *Transience* and *Formation* are to be understood as inseparable, just as how architecture is never *just* the tangible or *just* the intangible, but is always both, combined. As the project changes physically, so too does it change meta-physically as well – and vice



versa. The continued resolution of design and construction may bring about new ideas, or new interpretations of space, affording the project's cultural transience. Likewise, a shift in identity for the project invites new requirements of the built formation. The constant transformation – materially and immaterially – is largely resultant of *formation* and *transience* being interwoven. Architecture is, through this dichotomy, a *transient formation* of perpetual articulation. The adjacent drawing, *Transient Formation* [Figure 60], recalls the previous design research tactic from *Simultaneity IV* [see chapter 5, Figure 31], which unfolds an object temporally to reveal the object's different

moments of existence together, flattened, simultaneously. *Transient Formation* utilizes simultaneity to reveal its temporal nature of *becoming*. Potential futures of events, identities, material forms, and so on are all presented together. This attempts to capture Bruno Latour's idea of the 'flight' of architecture. The simultaneity is applied with a lighter touch in comparison to the design research so that the design in its current momentary state is presented with clarity while its potential futures are merely ghosted in. The linework displays the underlying logic to the order of potential amplifications in the project. The detail which drives formation is ever present at a multitude of scales.

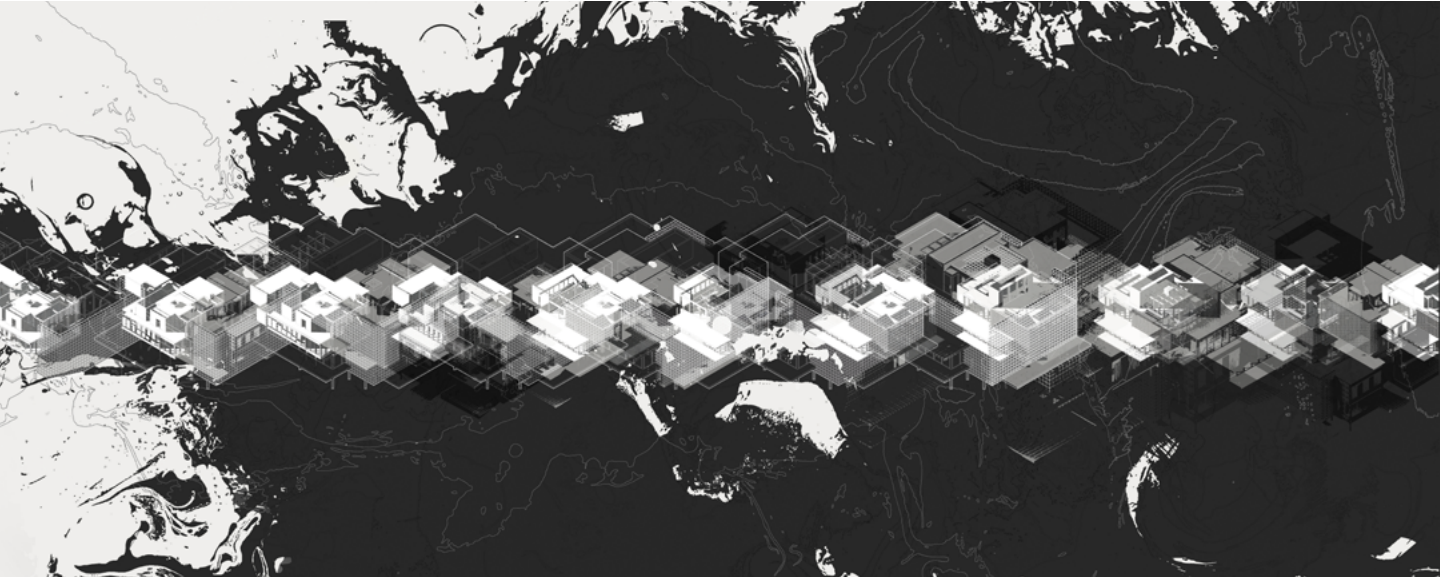




Figure 61 Approach, by author

10.1 The Ephemeral

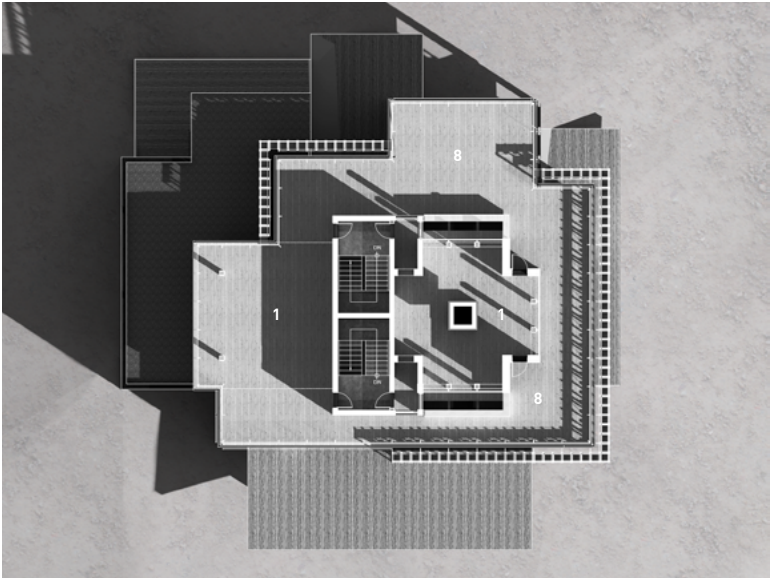
The *ephemeral*, defined simply as “lasting for a short time”² refers to all of the passing occurrences in architecture that form the temporal experience of being present in the locus. The ephemeral qualities of the atmosphere, the architecture itself and the events that occur all contribute to the fleeting moments that evoke a sense of transience in architecture. Whether it is the passing of sunlight over a day, or an occurrence such as the northern lights lighting up the night sky, these events lift the experiencing of architecture out of any false notions of stasis towards temporality. As we know from previous discussions, the idea of the ephemeral applies to the tangible aspects of

architecture as well. The material formation of architecture is a passing reality. Momentary, and always moving ‘forwards’. For this reason, the design project for this thesis is to be understood in the same manner. The design, layout, program, assembly, etc. that has been designed is a snapshot view of the project’s actuality.

The project in its current state had evolved from three previous major design iterations [see Appendix 3]. The weak point of the previous iterations of the project was the approach itself. I had not allowed myself to learn from the design research conducted previously, and instead opted to hastily produce a project which would attempt to

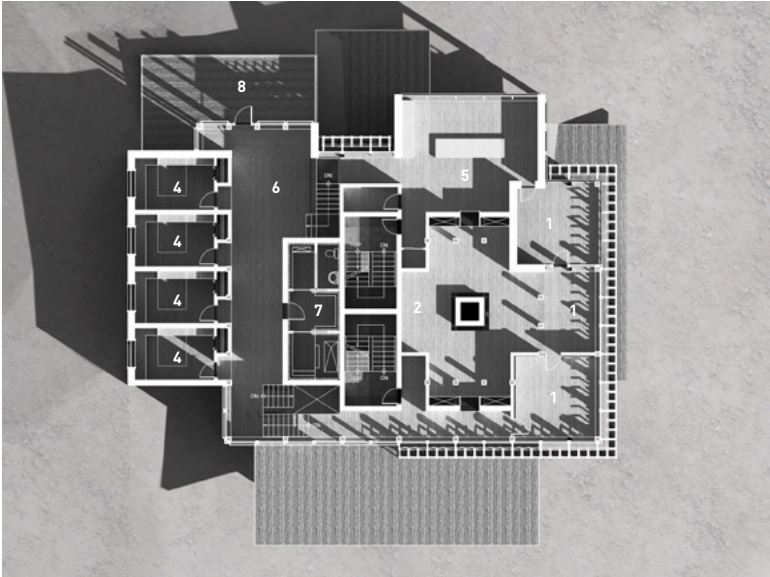


Third

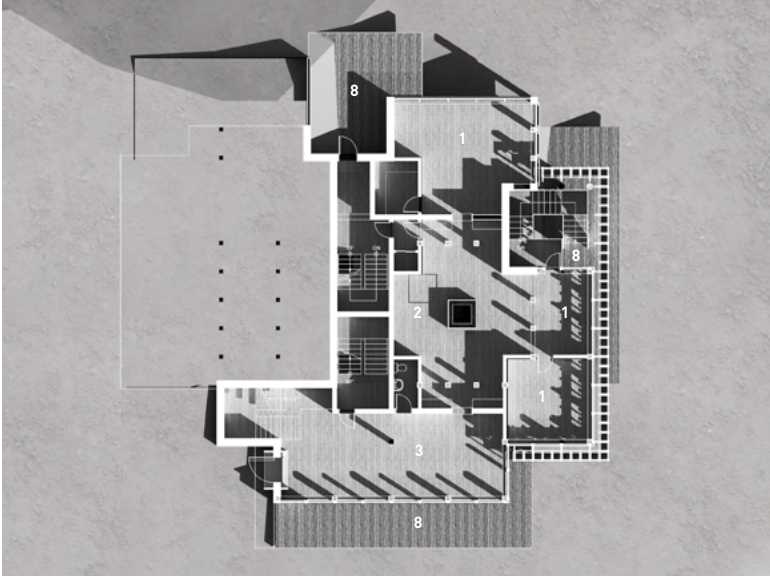


- 1 Production
- 2 Lounge
- 3 Exhibition
- 4 Private Studio
- 5 Kitchen
- 6 Living
- 7 Bath
- 8 Terrace
- 9 Storage, Water Tank, Utilities (below, not shown)

Second



First



reveal temporal concepts, as oppose to it being an *embodiment* of the concepts. As we discussed in chapter 5, *The Primacy of Process*, with the drawing title *Process* [Figure 23], a process based approach allows the designer to 'carve' out a path for themselves, favouring the phenomenon of discovery. This approach that I opted to adopt through my work had fallen to the wayside in favour of a more traditional approach of imagining a form, then attempting to justify it through material. With that approach, I had fallen into my own criticism of architecture without process.

The current iteration of the design project went back to the idea of discovery and pure process. As previously discussed, it began as a detail; a driver of formation – not only the project's formation over time, but the *design* formation as well. The physical core of the locus was based off of the detail, and the design expanded outwards based on the logic set out by the detail and its accompanying grid. Through a process of sketching and modeling, transience spaces were added to the design out of programmatic necessity, and also based on an imagined narrative of the project's *becoming* over time. With this process of design, the overall design of the project could never have been initially imagined. Rather, it had to be discovered over time.

The design unfolding previously shown in

Chapter 8 had resulted in a snapshot moment of the project's life, as seen in the adjacent images. To explore the design of this moment, we will take the ephemeral perspective of one prospective actant arriving at the locus as part of their personal pilgrimage.

Figure 62 [opposite, top] *Third floor plan*, by author
Figure 63 [opposite, middle] *Second floor plan*, by author
Figure 64 [opposite, bottom] *First floor plan*, by author

Exhibition

The entrance to the retreat contains a bright airy space that acts as a welcoming area for visitors as well as an exhibition space for resident artists. With its adjoining exterior terrace and an abundance of transparency, a heightened connection to the landscape is established. When not being used for visits, artists may use the space to draw inspiration from the landscape.

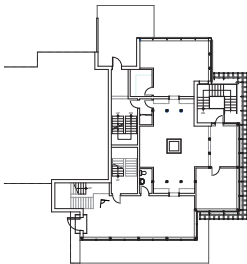


Figure 65 *Exhibition*, by author



Hearth

The chimney for the hearth is supported by the glulam beam structure above. With a glass encased firebox, the hearth gives the appearance that it is floating; giving a sense of lightness and impermanence. The entire structure is clad with cedar boards finished using the Japanese wood burning technique, giving it an expression of energy processes and ephemerality.

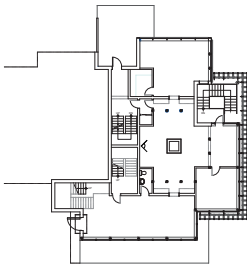


Figure 66 [opposite] *Hearth*, by author



Work Room

A large workspace which projects outwards from the core creates a repetition of the expressive structure. With expansive views of the surrounding territory, the lines created from the glulam structure direct the eyes outward, suggesting that the space could also continue outwards, indefinitely.

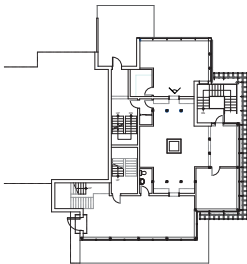


Figure 67 [opposite] *Workroom*, by author



Small Work Spaces

The smaller work spaces provide a heightened experience of the ephemerality of the landscape. The lattice structure on the exterior creates patterns of light on the walls and floor in the early mornings which creeps along with the rising sun to the eventual afternoon sunlight being blocked by the sun shading device.

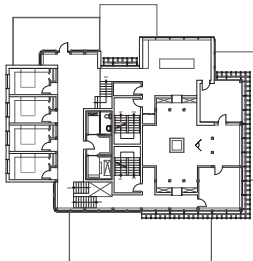


Figure 68 [opposite] *Workroom 2*, by author



Threshold

The thresholds provided give a heightened sense of importance to the core area, and demarcate a passage between the darker interior - where the focus is on the centre - and the much brighter surrounding spaces - which look outwards to create a connection with the outside landscape. Passing the threshold from darkness into light once again brings the ephemeral qualities of light into focus.

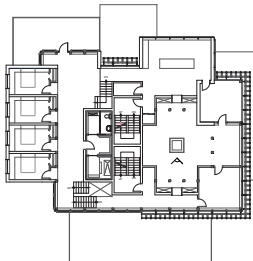


Figure 69 [opposite] *Threshold*, by author



Top Floor

The top floor was designed for maximum transparency to provide views in nearly all directions. The core space wrapped in glass, and the adjacent terraces, give the top floor a porous quality where the interior feels like an extension of the exterior.

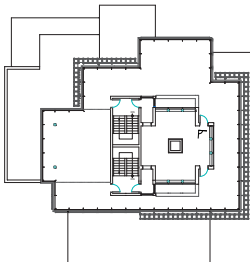


Figure 70 [opposite] *Top Floor View*, by author



- 1 Production
- 2 Lounge
- 3 Exhibit
- 4 Private Studio
- 5 Kitchen
- 6 Living
- 7 Bath
- 8 Terrace
- 9 Storage, Water Tank, Utilities

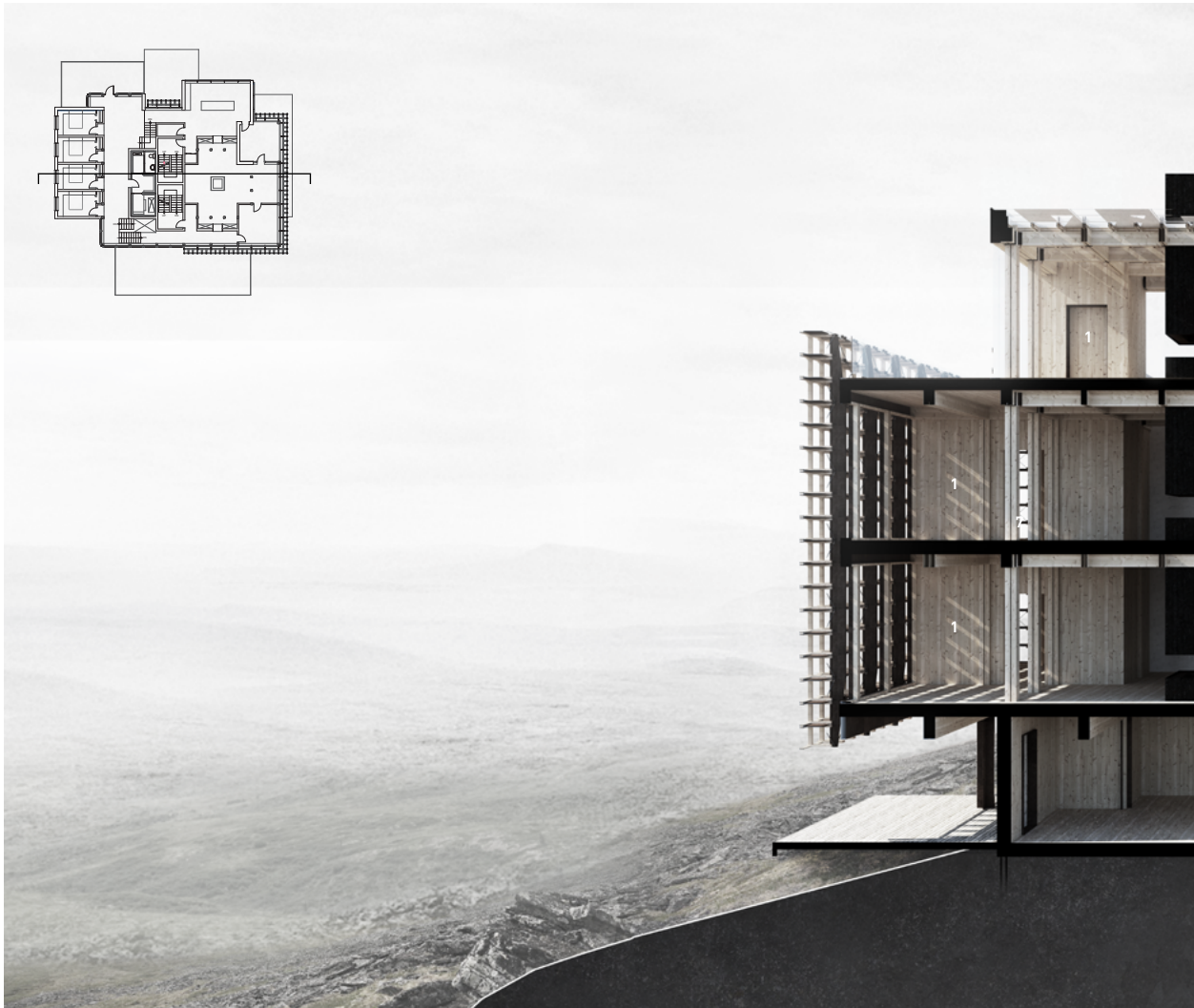


Figure 71 [opposite] *Longitudinal Section*, by author



10.2 Becoming

The body of work produced over the course of the year had been my own attempts to work towards a temporal architecture. What is temporal architecture? As hinted at in the title of this final chapter, *towards a temporal architecture*, it may not be some realized *thing* that can be reached; there can be no prescriptive set of conditions or design motifs that define a temporal architecture. As I reflect on the work produced, it was perhaps not about formulating a new kind of architecture that would spawn from a unique approach - it was about looking at architecture differently. Rather than creating something novel, it is about *unfolding* what is already in front of us - unfolding the temporal nature of architecture. The design project plays into the principles of temporal architecture in a heightened way to try to reveal their implications for architecture. *Formation* and *Transience* captured a way of thinking through design. The material and immaterial aspects were understood in terms of flows of energy - the project is, similarly, seen as the open system of these flows: a *locus* of activity where material and culture are brought together for a time, where they are interwoven in a process of perpetual change. Over time, the design project is continually refined through a new amplification of these forms of energy. It evokes a thermodynamic dissipative

system. This dynamic behavior of architecture allows us to understand the project as an inherent part of the interconnected system of nature. Like all formations, the project is an organization of matter, energy, space and physical time, constantly changing with the world around it.

With the constant change of the architectural project, the role of the architect is more involved in the frequency of construction and occupancy that occurs continuously. The architect-as-actant notion depicts the designer as one who may discover - or design - from within. Architects often have an eye for spatial potential, and with a temporal perspective, the architect is designing for the next moment of a project's life: its flow of events, and the evolution of the locus. By designing the flow of the tangible and intangible, the architect is the *mediator* of *becoming*.

As architecture itself experiences a becoming, we, as actants entering into the locus, experience transformations of our own. In Chapter 5 we discussed how a design is 'active' during its process of being designed; in this active state of creation we as designers may experience a phenomenon of change in the form of a learned experience, a revelation, and so on. Once the design is finished, the learned experience, for the most part, ceases for the designer. This learned experience transfers to the transient inhabitant of the



reatreat. When an actant leaves to return to their regular lives, they are not the same person as when they entered.

This learned experience of becoming is directly applicable to temporal architecture. As we discussed, the architectural project is never 'finished', and therefore, never can reach a state where its influence on the designer – and all actants – ceases. For the architect that views architecture as static and finished, that element may be lost. But if we engage architecture as a temporal formation that is always becoming, where the flows of energy are perpetual, then perhaps there is more to discover.

NOTES

- 1 Bruno Latour and Albena Yaneva, "Give Me a Gun and I Will Make All Buildings Move; An ANT's View of Architecture," n.d., 81.
- 2 "Oxford Dictionary."

APPENDIX 1

Model Photographs

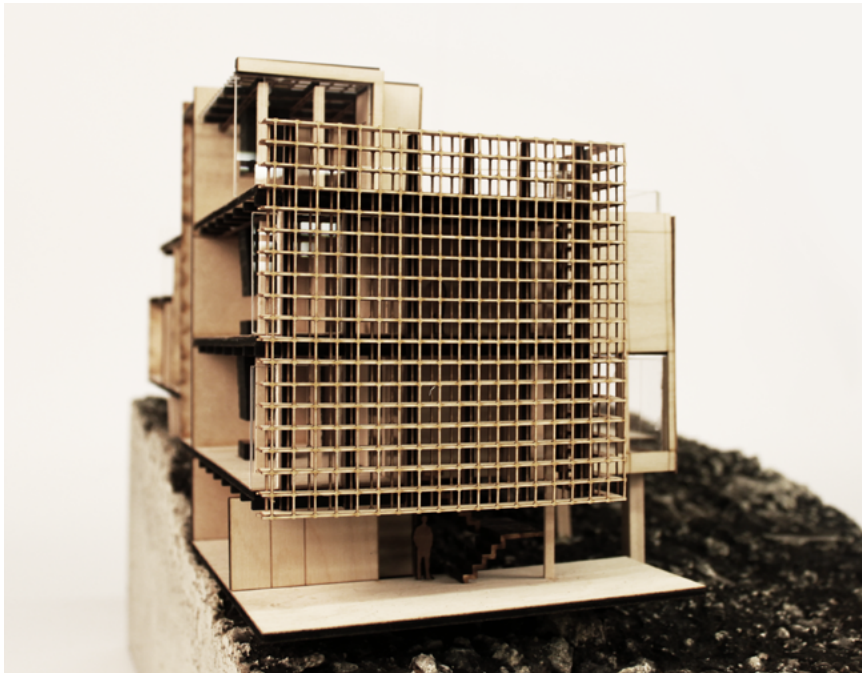


Figure 73 [above] *Project Model*, by author

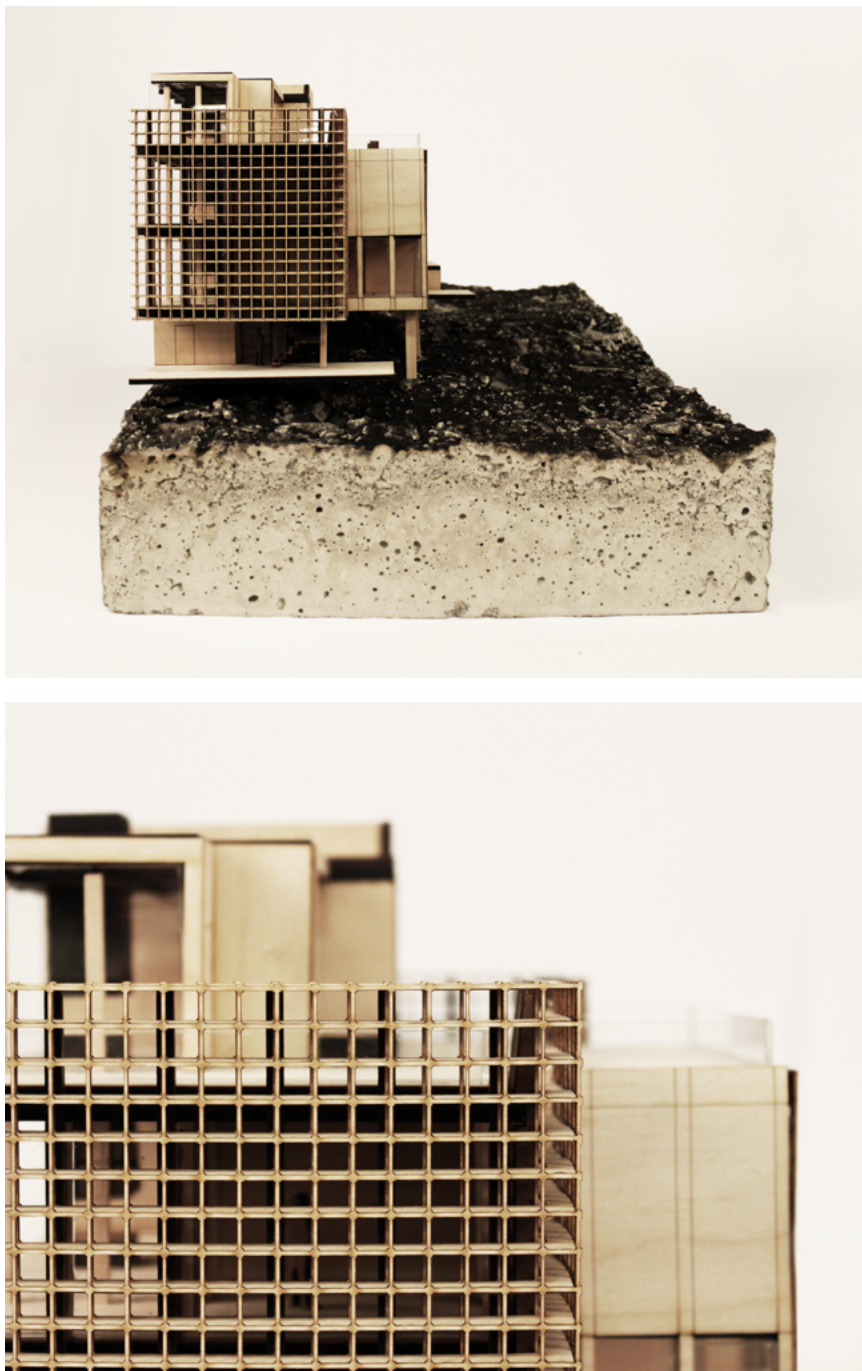


Figure 74 [top] *Project Model*, by author
Figure 75 [bottom] *Project Model*, by author

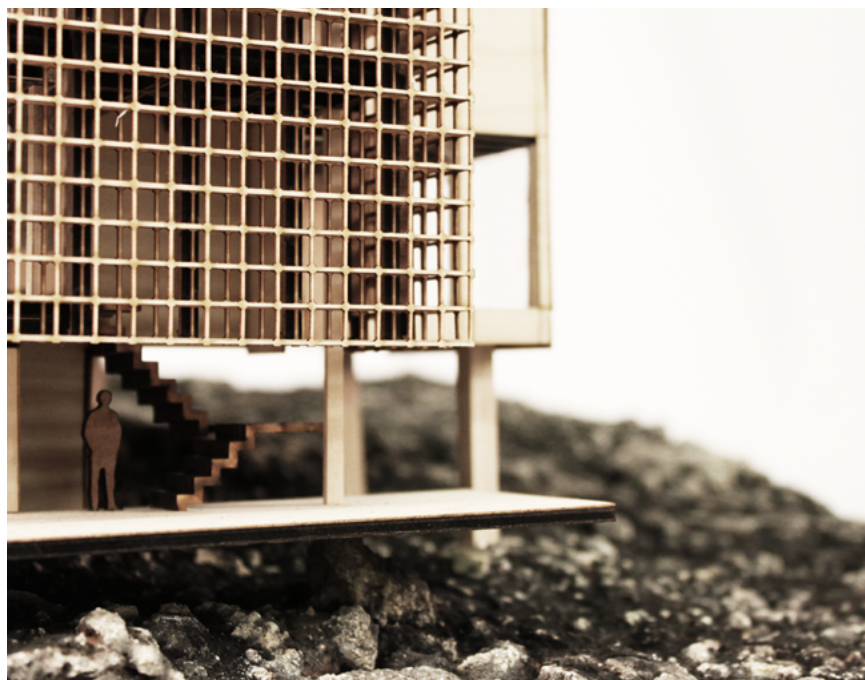


Figure 76 [top] *Project Model*, by author
Figure 77 [bottom] *Project Model*, by author



Figure 78 [top] *Project Model*, by author
Figure 79 [bottom] *Project Model*, by author



Figure 80 [top] *Project Model*, by author
Figure 81 [bottom] *Project Model*, by author

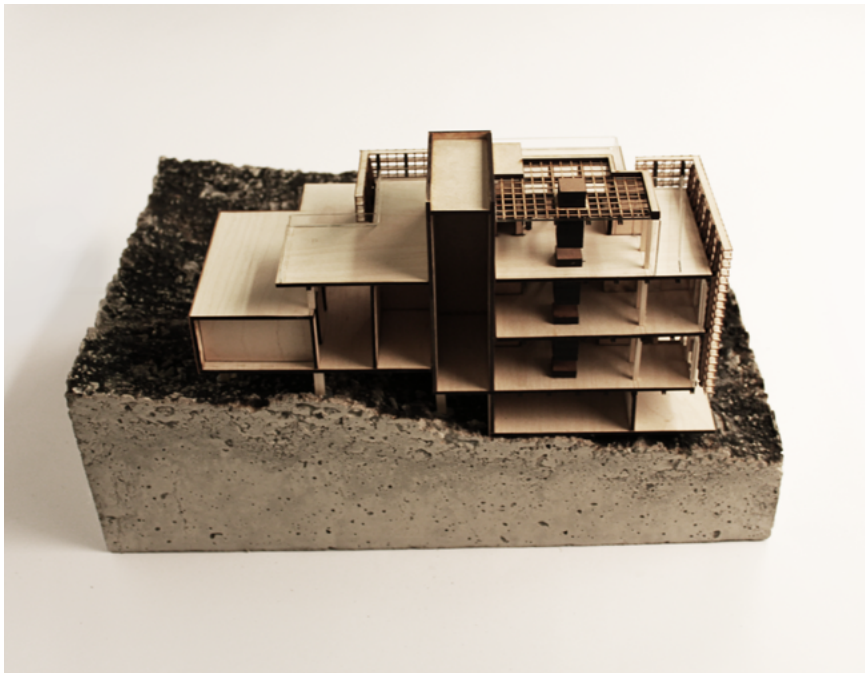
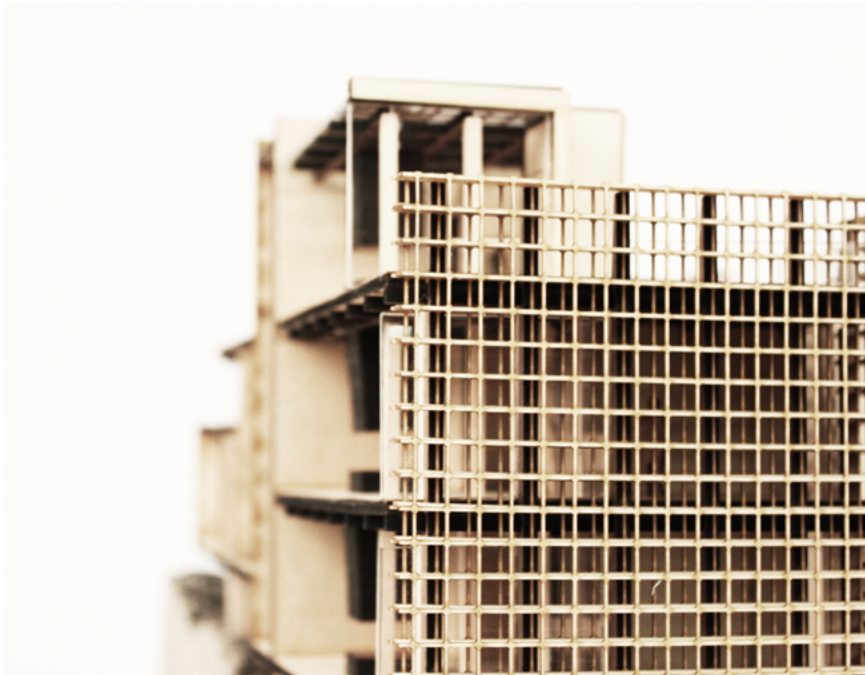


Figure 82 [top] *Project Model*, by author
Figure 83 [bottom] *Project Model*, by author

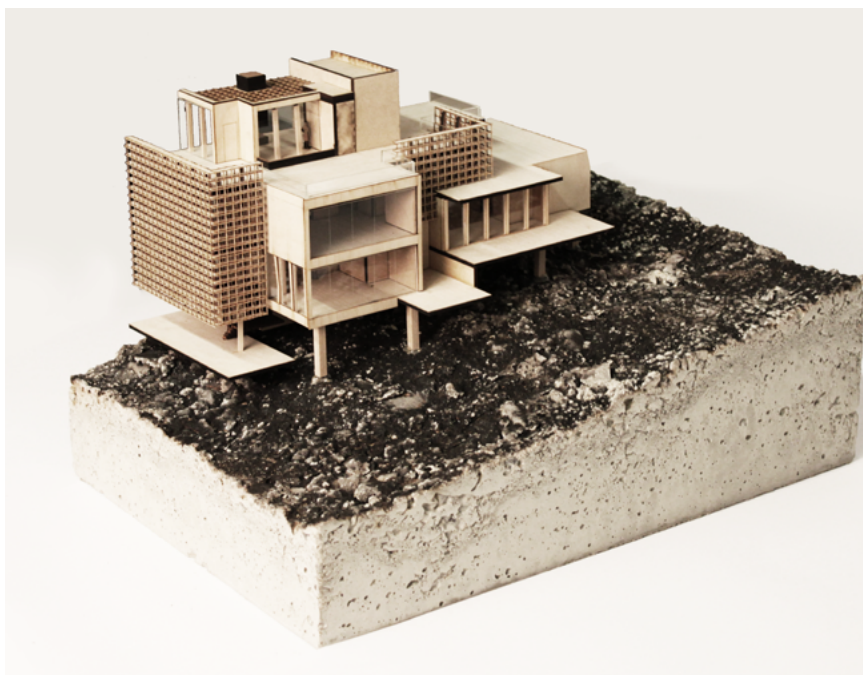
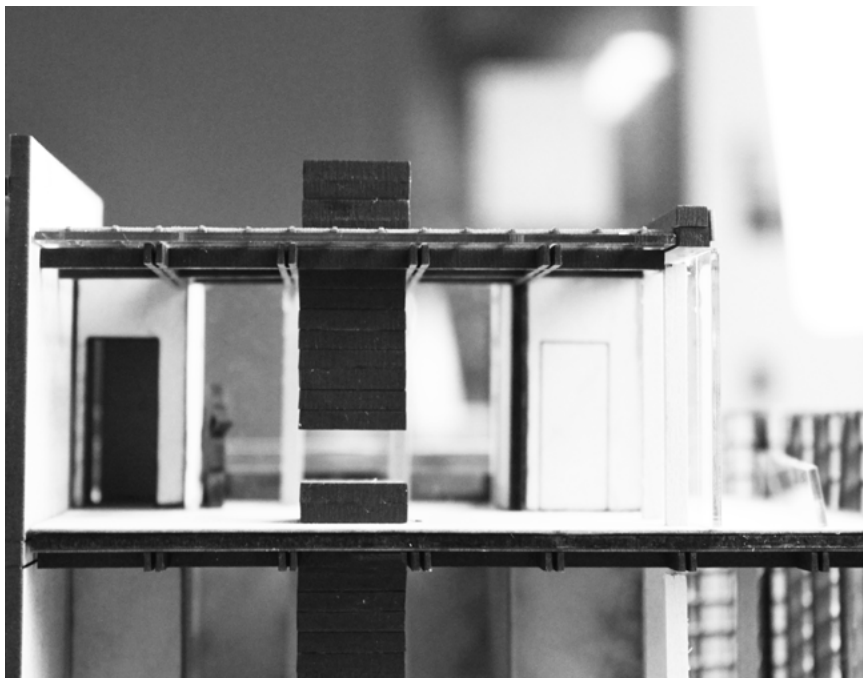


Figure 84 [top] *Project Model*, by author
Figure 85 [bottom] *Project Model*, by author

Site Model

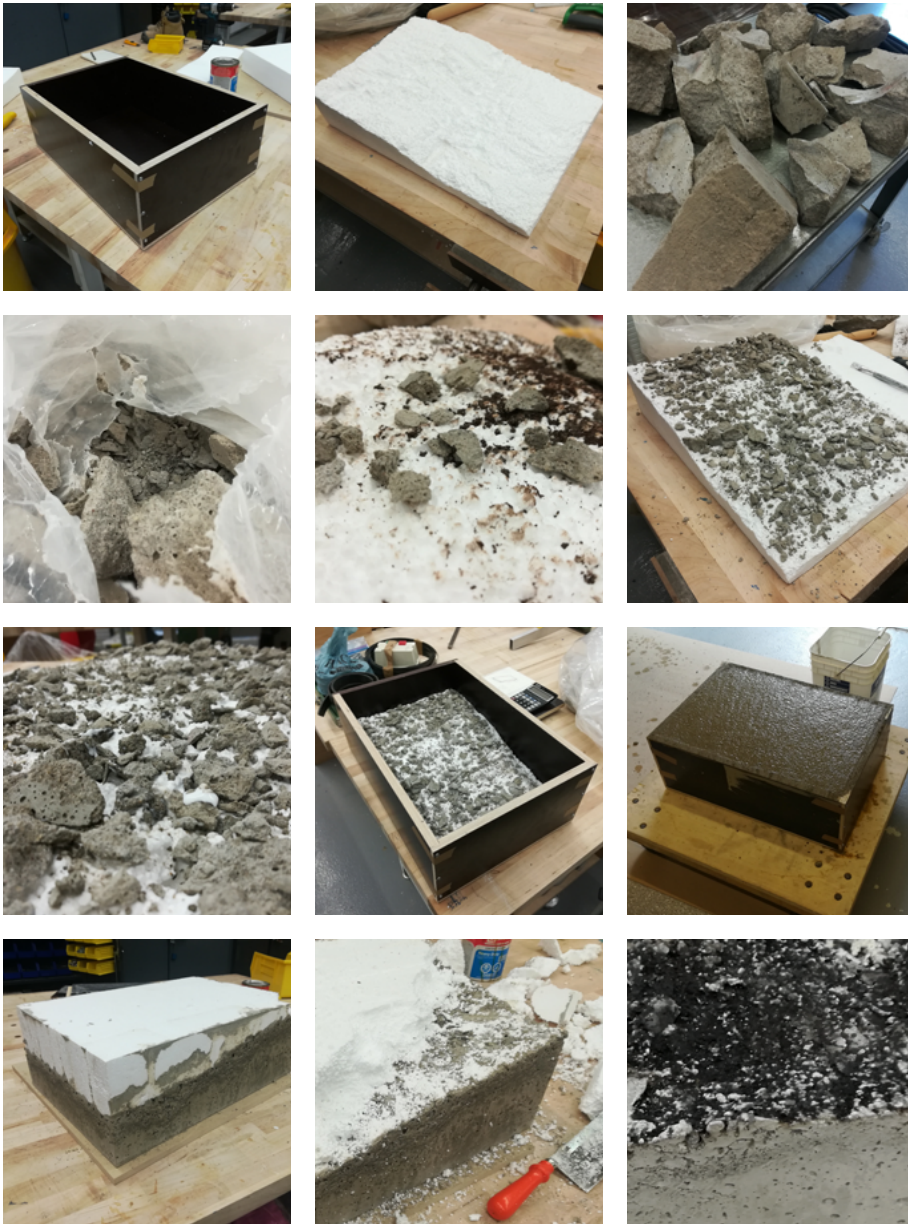


Figure 86 [above] *Site Model Process*, by author

Project Model

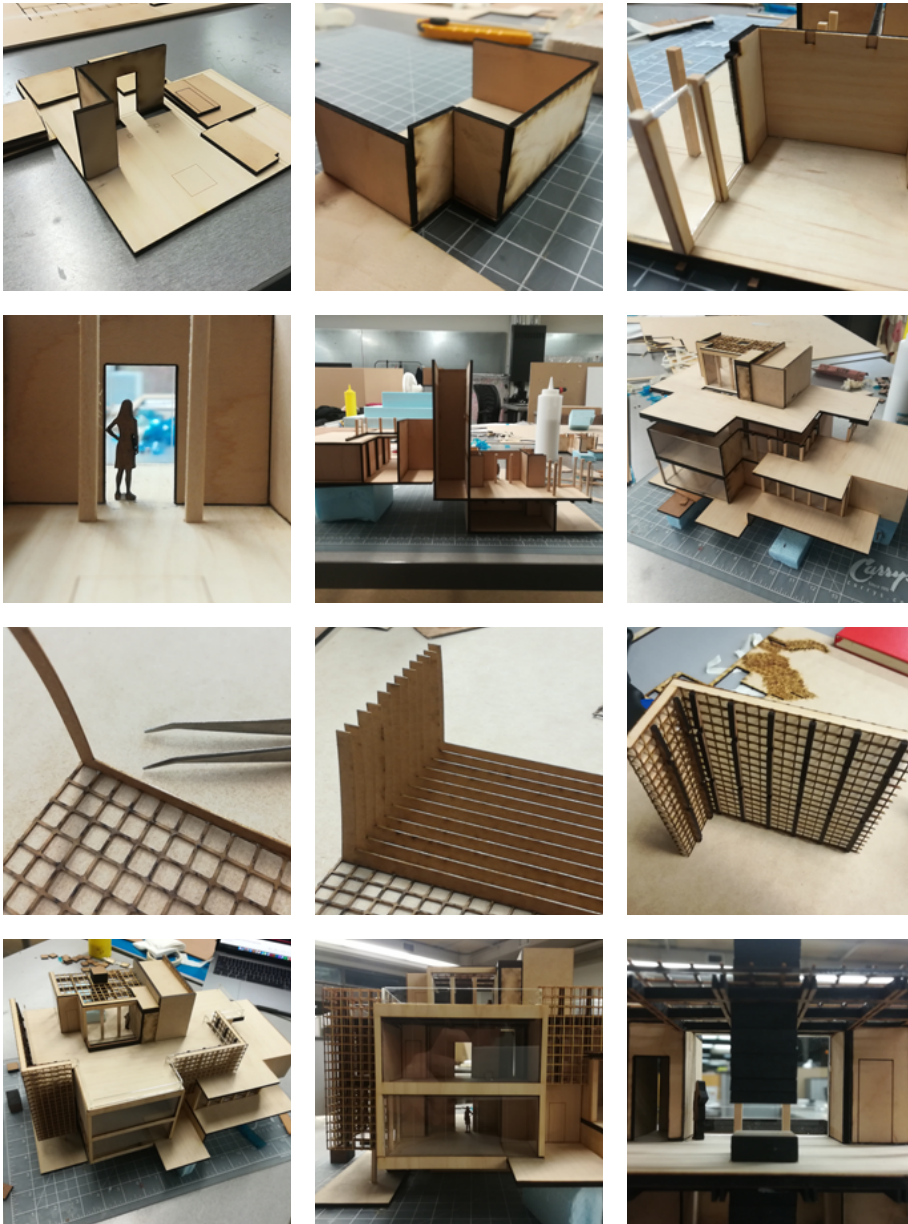


Figure 87 [above] *Project Model Process*, by author

APPENDIX 2 Drawings



Figure 88 [above] *Thesis Drawing Spread*, by author

APPENDIX 3 Design Research

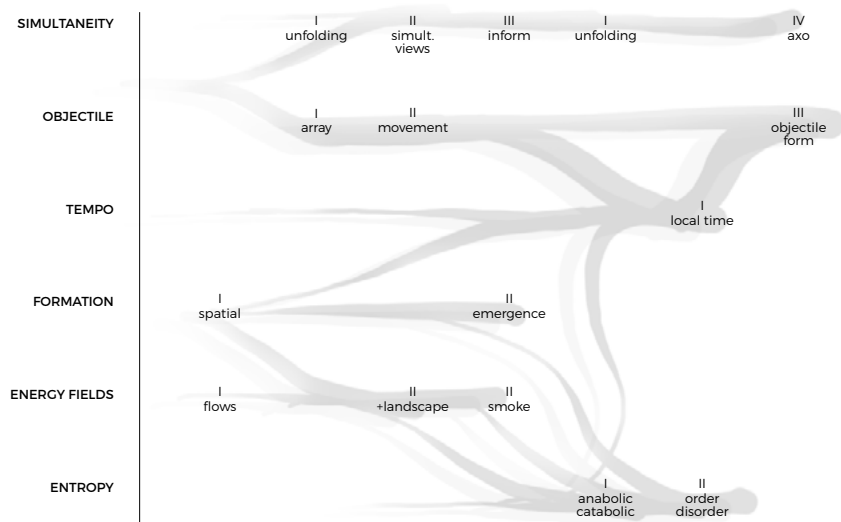


Figure 89 *Design Research Plan*, by author

Objectile

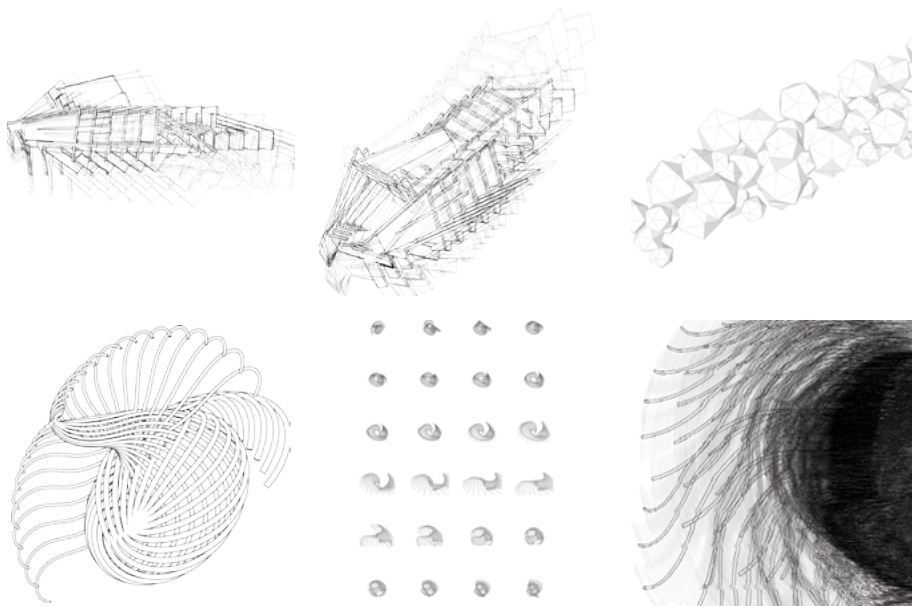


Figure 90 [above] *Objectile Studies*, by author

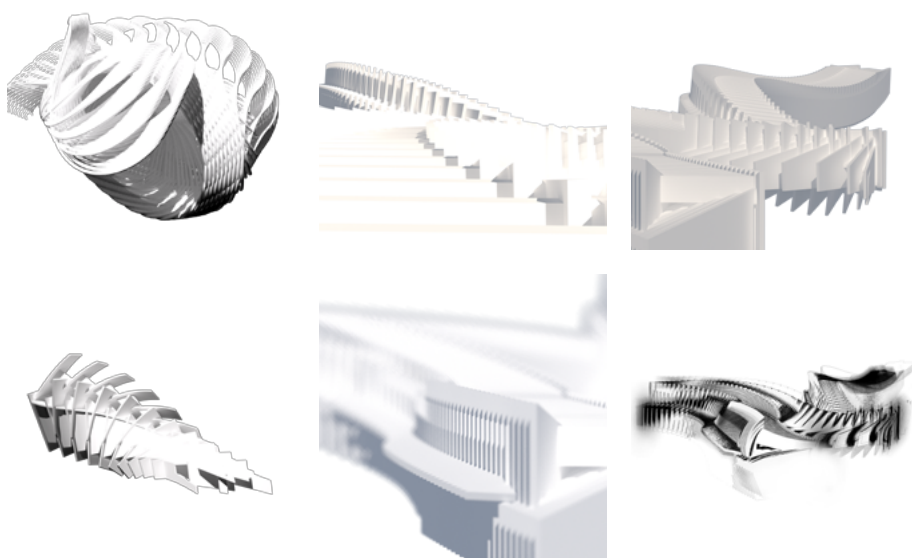


Figure 91 [above] *Objectile Studies*, by author

Tempo



Figure 92 [above] *Tempo I*, by author



Figure 93 [above] *Tempo I Details*, by author

Entropy

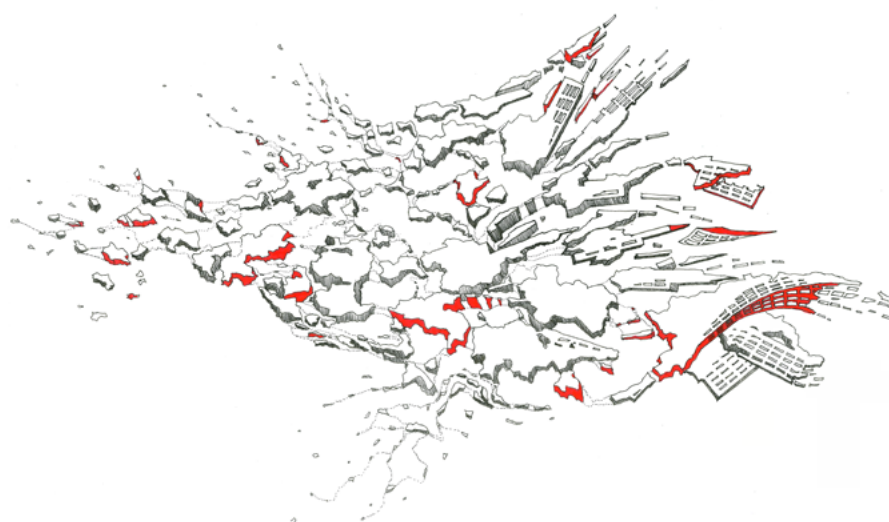


Figure 94 [above] *Entropy I*, by author

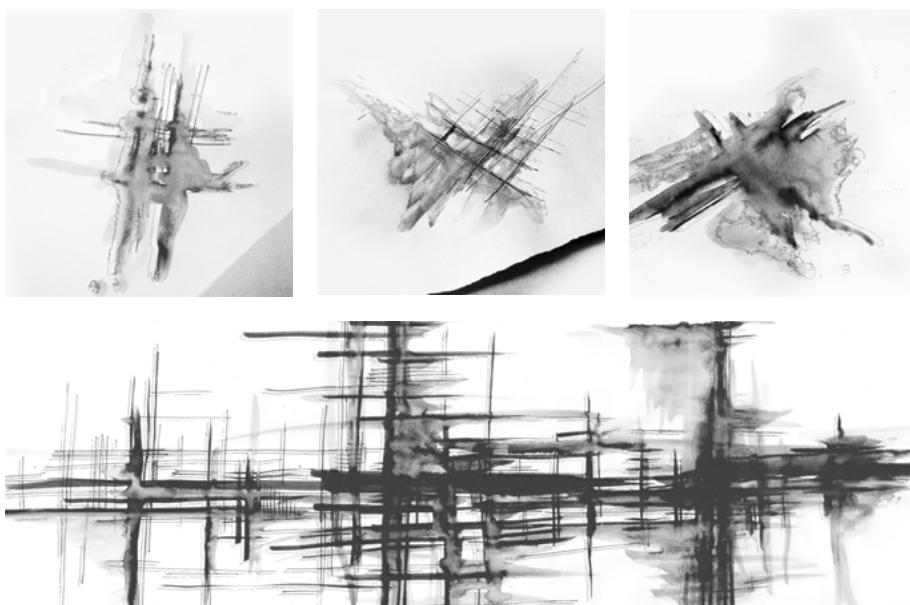


Figure 95 [above] *Entropy II Studies*, by author

Simultaneity

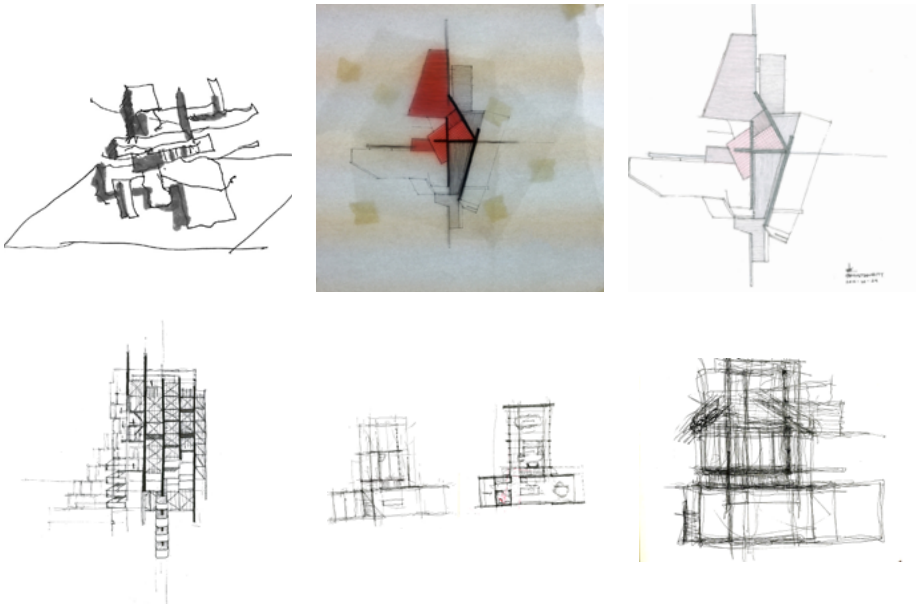


Figure 96 [above] *Simultaneity Studies*, by author

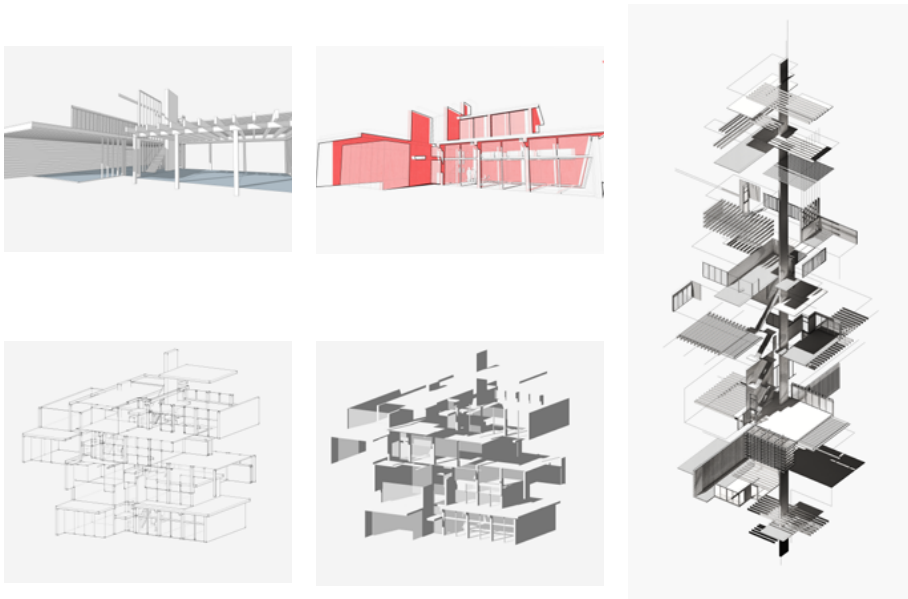


Figure 97 [above] *Simultaneity IV Details*, by author

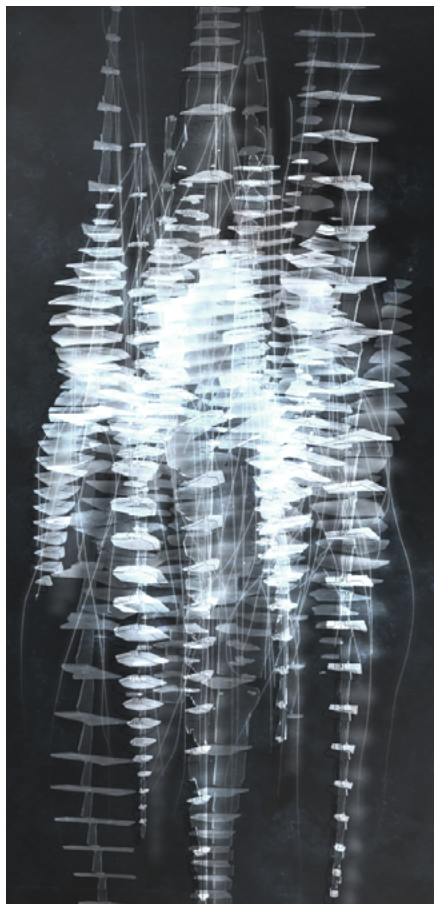


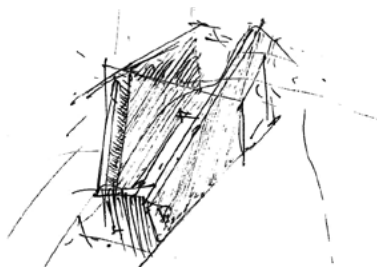
Figure 98 [above] *Emergence*, by author



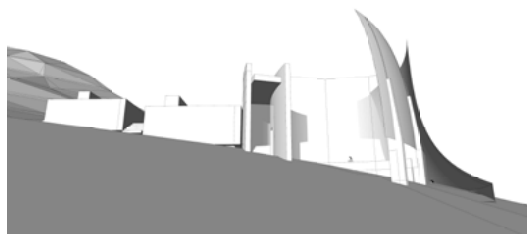
Figure 99 [above] *Dissipative Structure*, by author

APPENDIX 4 Project Iterations

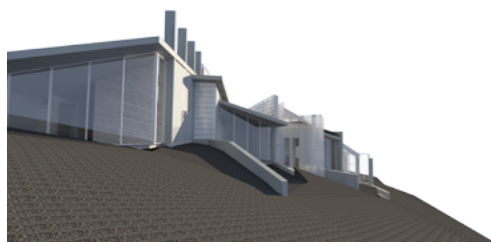
i. initial ideas



ii. first approach



iii. second approach



iv. third approach

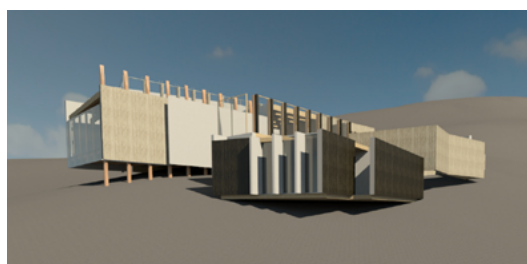


Figure 100 [i] *Cottage Sketch*, by author

Figure 101 [ii] *First Approach: Perspective*, by author

Figure 102 [iii] *Second Approach: Perspective*, by author

Figure 103 [iv] *Third Approach: Perspective*, by author

Initial Ideas: Cottage on Georgian Bay

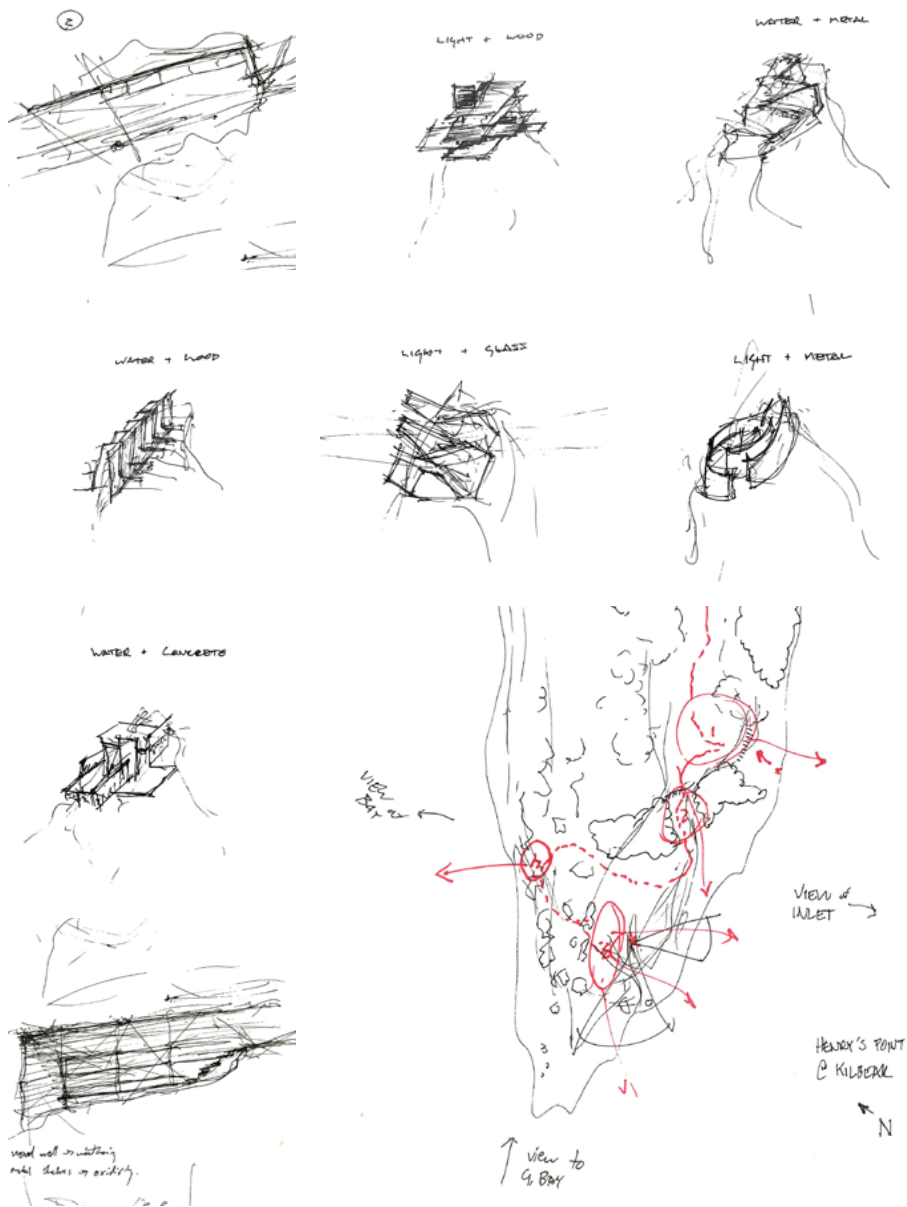


Figure 104 [above] Cottage Sketches, by author

Georgian Bay Site Visit



Figure 105 [above] *Site Visit*, by author

First Approach

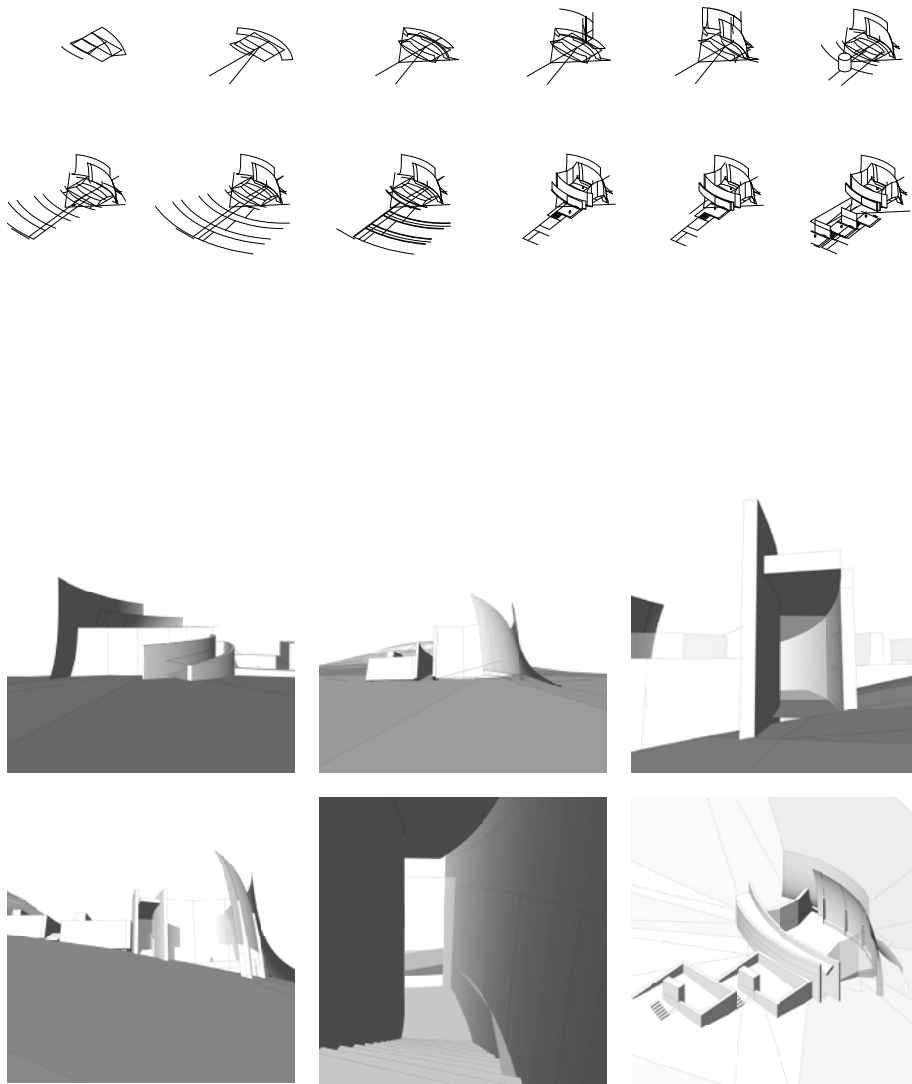


Figure 106 [above] *First Approach: Process Drawings*, by author

First Approach

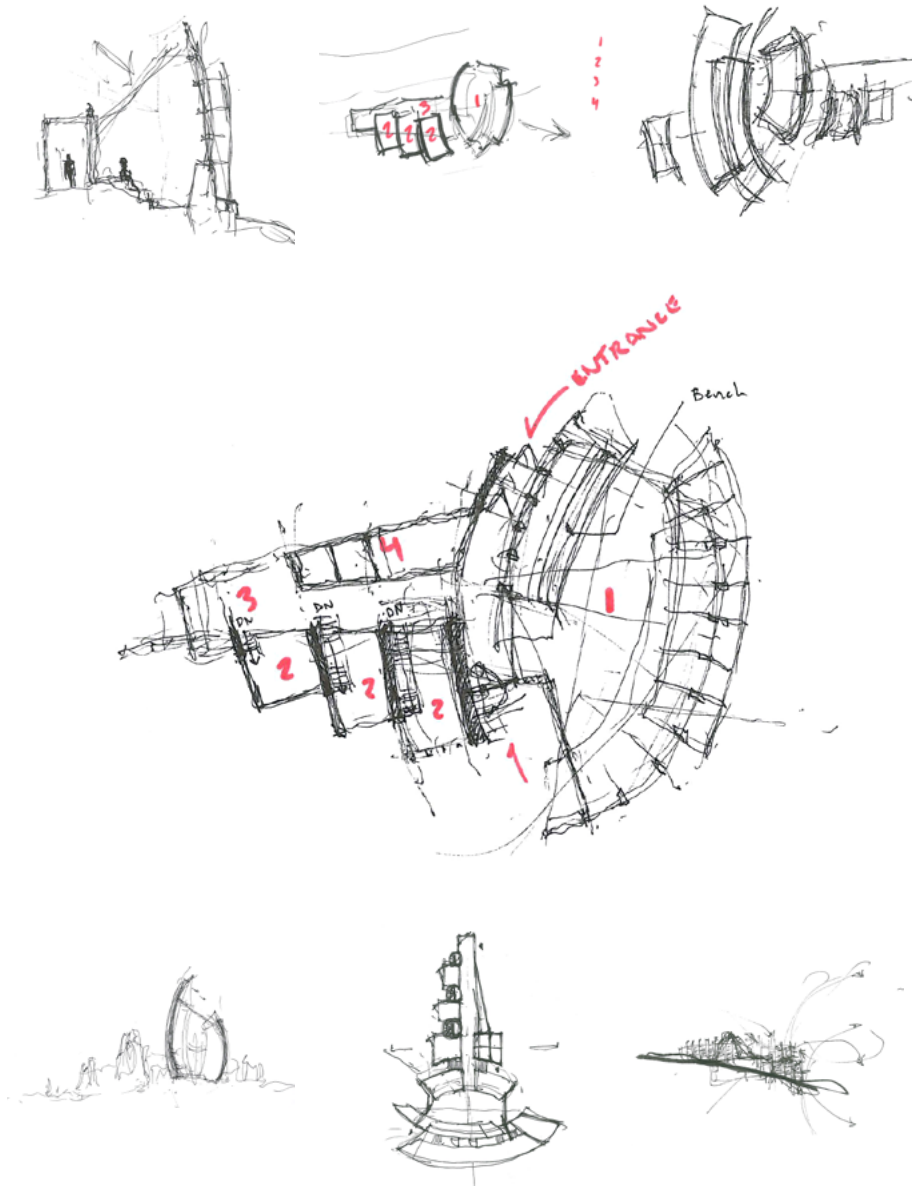


Figure 107 [above] *Design Sketches*, by author

Second Approach

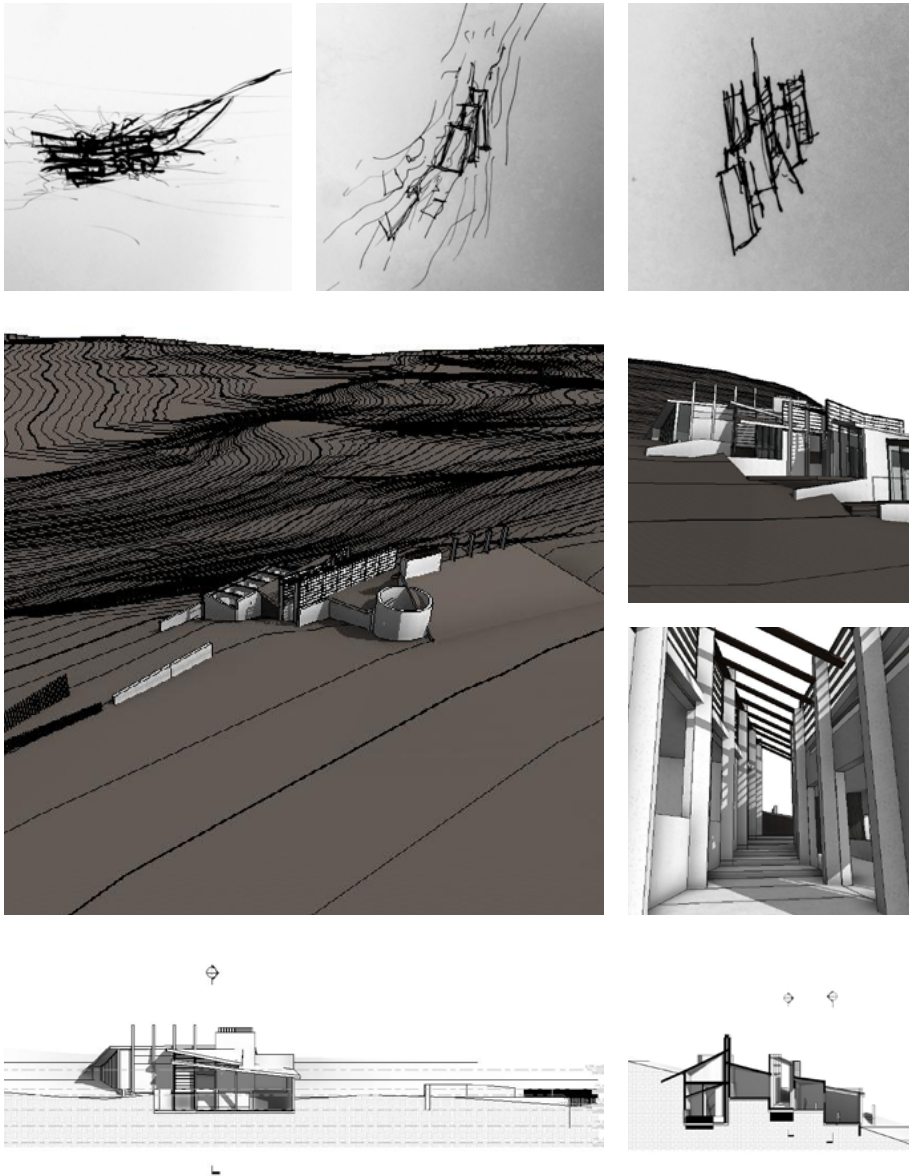


Figure 108 [above] *Second Approach Drawings*, by author

Second Approach

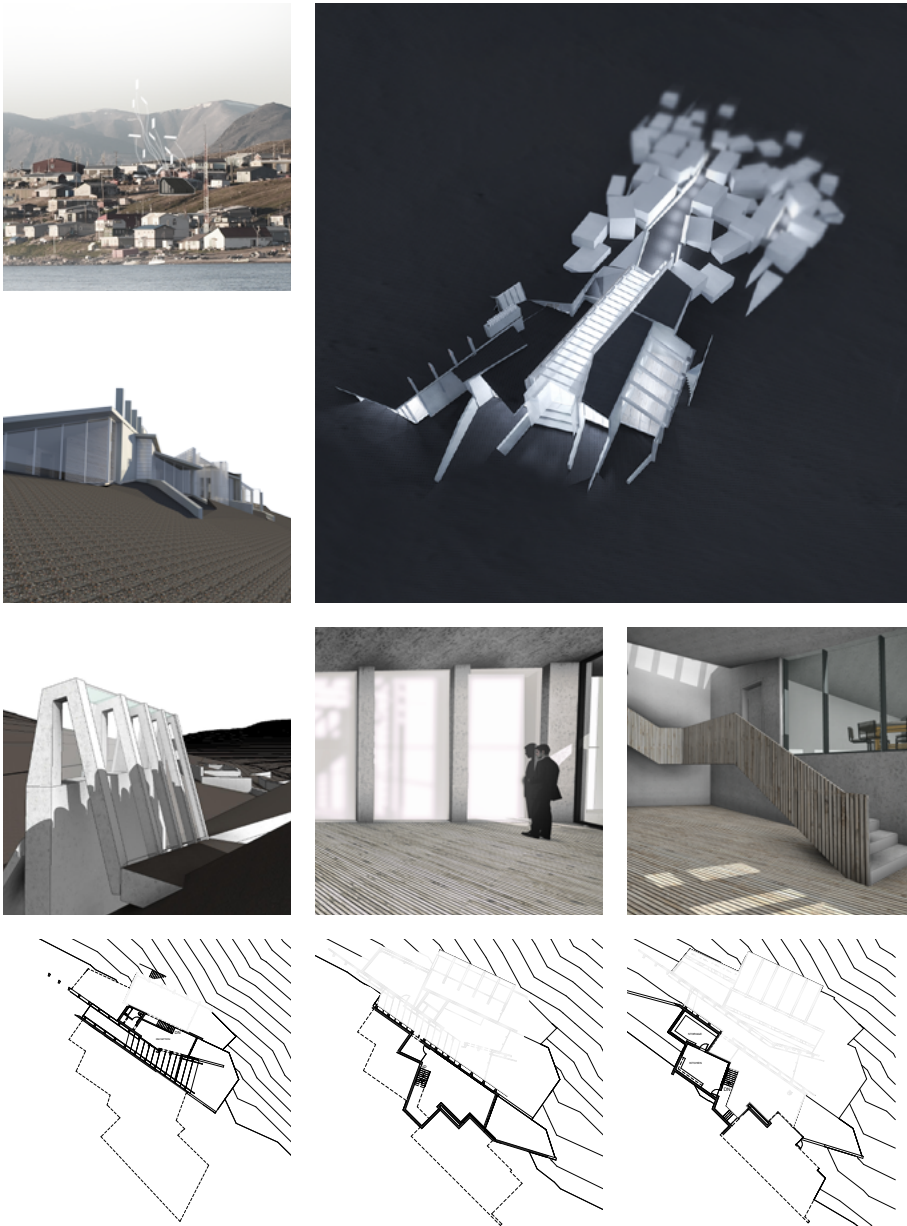
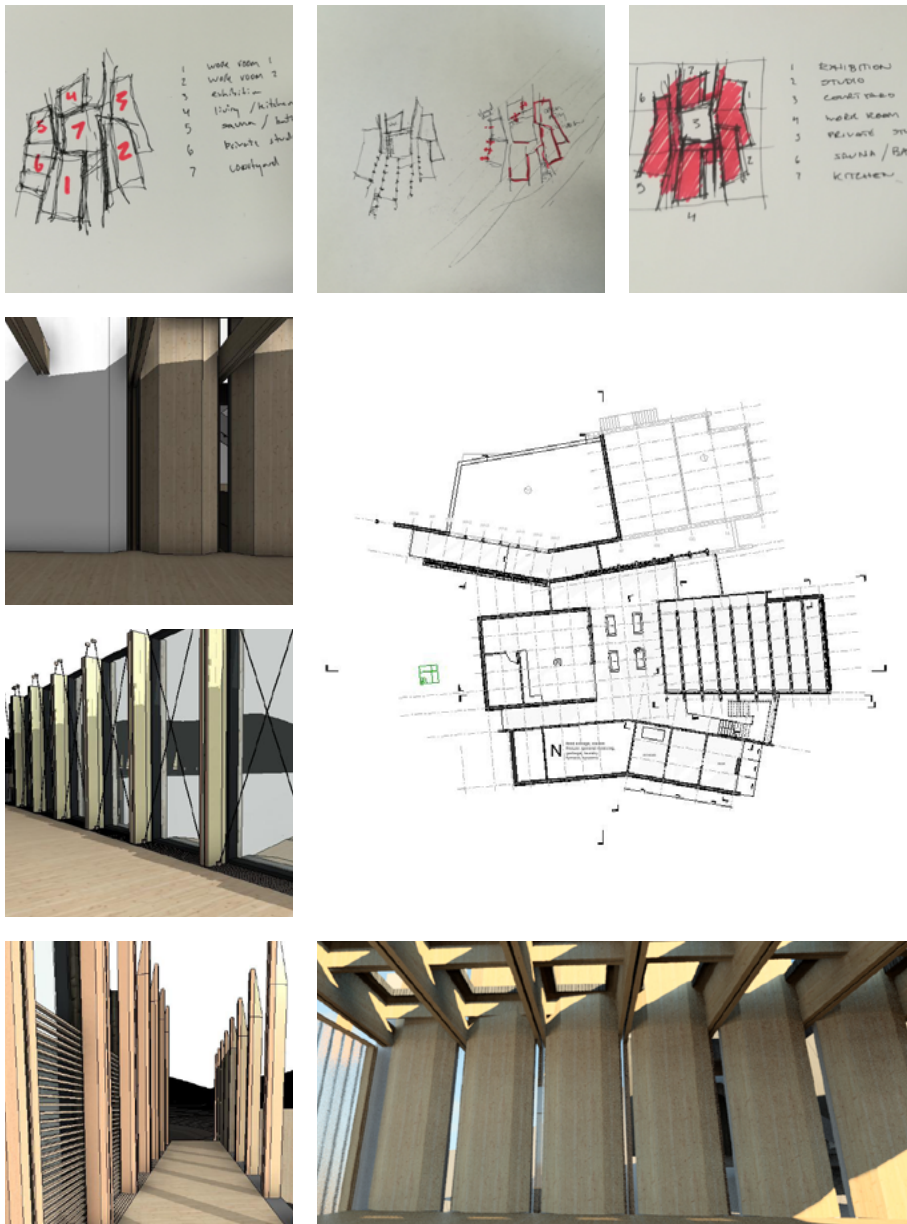


Figure 109 [above] *Second Approach Drawings*, by author

Third Approach

Figure 110 [above] *Third Approach Drawings*, by author

Third Approach

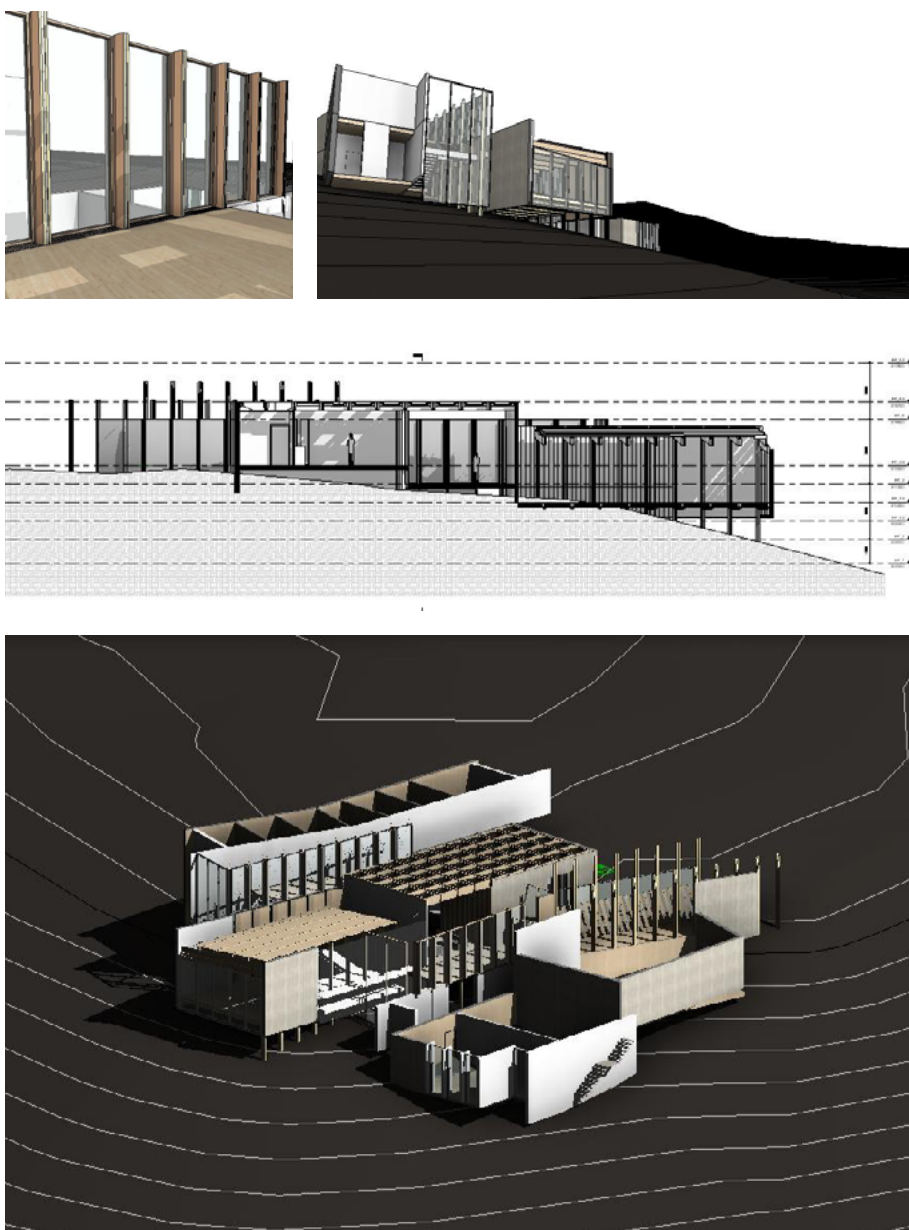


Figure 111 [above] *Third Approach Drawings*, by author

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