OVERCOMING SUBURBIA THROUGH KINETIC SPACES

Anti-Static:
Overcoming Suburbia through Kinetic Spaces

by

Thomas Hugo Rogers

A 120-point thesis
submitted to the Victoria University of Wellington
in partial fulfilment of the requirements for the
degree of Master of Architecture (Professional)

Victoria University of Wellington
School of Architecture

2016

Anti-static — I

Abstract

Problem

Anti-Static critiques economically driven development that is exclusive of the natural environment creating uninspiring places comparable to low density urban environments. It proposes a new system of building, using motion of traditionally static elements, that encourages flexibility of space, sharing, and achieves higher densities and better connections to the natural context.

Location

A strong reliance on vehicular transport and the ‘Pavlova Paradise’, or quarter-acre dream mind-set has created a sprawling built environment and inflexible building stock that threatens to engulf the landscape. Queenstown is an extreme example of this condition; intense pressure to develop is resisted by a need to protect the beautiful environment that attracts nearly two million visitors annually. Current solutions look to satellite towns, but this poses many issues regarding increased infrastructure use and environmental degradation.

Aims and Objectives

This thesis applies the system to propose new standards for upwards and inwards development that focuses on sequestering integrated public open space. The theoretical component of this thesis argues

for the intertwining of an objective and subjective theory: ‘*Biophilia*’ and ‘*Picturesque Beauty*’. It is argued that ‘*picturesque beauty*’, a visual style that appreciates natural composition, is strengthened by the contemporary theory of Biophilia, which states that people are intrinsically drawn to natural processes.

The aims of this thesis are to develop a way of improving density, desirability and environmental performance of the suburban environment. It also aims to encourage an effective engagement with, integration into and connection to the natural environment. These aims are achieved by firstly establishing a case for environmental reintegration, understanding the benefits, requirements and visual theory so that it may be integrated effectively, secondly by researching and interrogating current systems from dense environments that improve efficiency through motion within buildings, establishing their context, intention and effectiveness, thirdly by designing and implementing a system that improves the spatial variety, environmental connection and efficiency through an iterative process, finally by testing the design in a comparative masterplan to an existing development and commenting on the success based on the established criteria.

Acknowledgements

Firstly, thank you to my parents, David and Sally, for your unwavering support throughout the entirety of my education.

To my supervisor Guy Marriage, I am thankful for your confidence in me, your friendship and your unconditional support throughout the year.

To all my beloved friends that have borne my occasional complaints and constant odd humor, the time I have shared with you inbetween work has made all the work worthwhile; I am truly grateful to have met such people as you. A special mention to Anneke for sharing a love of coffee and conversation.

Thank you to Erin and James for giving me a light at the end and showing me what my years of hard work have been for.

Finally, thanks to Hannah for bearing with me and supporting me when it may have seemed like the thesis was the most important thing in my life.

Contents

1	Introduction	1
2	Problem: Suburbia	5
3	Ecosystems	9
4	Picturesque Movement Theory	15
5	Location Queenstown	23
6	Precedent Study	33
7	Design Tests	41
8	Final Design	57
9	Exegesis	89

Introduction

OVERLEAF.

Figure 1.01. Author's own image, taken from site in Queenstown

Problem Statement

Dense urban environments and sprawling suburban environments have a tendency to lack a critical counterpart of any built environment; integrated natural spaces (figure 1.02). Zoning regulations tend to treat land as an area to be filled with the prescribed building type, not as one to become integrated with the natural features of the surrounding environment. It is this approach to sectional development that enables land to be progressively filled as requirements for housing rise and resistance to developments wavers. Eventually no natural feature remains and upward development results.

These resultant dense environments have invoked design responses that use movement of building elements and multi-programming of spaces to reclaim some of the spatial freedom that is lost in apartment design. These are applied in hindsight, however, and do not solve any issues beyond the envelope of the building and consequently cannot foster any useful connection to the outside world.

Aims:

Develop a way of improving density, desirability and environmental performance of the suburban environment.

Encourage an effective engagement with, integration into and connection to the natural environment.

Design and test ideas at a variety of scales from detail to masterplan.

RIGHT>.

Figure 1.02. Image demonstrating alternate reality with a river of cars.

Objectives:

Establish through research the mindset and issues that have created the problem, gaining a realistic perspective on the limitations that are to be worked within.

Research factors that contribute to making an environment desirable to live in, based on both subjective and objective features.

Establish a case for environmental reintegration, understanding the benefits, requirements and visual theory so that it may be integrated effectively.

Research and interrogate current systems from dense environments that improve efficiency through motion within buildings, establishing their context, intention and effectiveness.

Design and implement a system that improves the spatial variety, environmental connection and efficiency through an iterative process.

Test the design in a comparative masterplan to an existing development and comment on the success based on the established criteria.

Location and Program

Queenstown is investigated as the context for this design. The solitary landscapes attract an average daily visitor population of 17,100 in addition to the resident population of 30,700.¹ Megan Ash from Baxter Design Group based in Queenstown discusses the biggest issue faced by the town; tourism is Queenstown's main industry and there is significant pressure for the town to provide activities, jobs and accommodation for tourists while maintaining the landscape that attracts them there.² This thesis responds to this housing-landscape pressure by providing medium to long-term accommodation that has a reduced footprint on the landscape and focuses on the surrounding environment.

1. Statistics NZ, 2006.

2. Ash, 2006. Megan Ash is from Baxter landscape Design Group based in Queenstown.

Thesis Structure

The aim of this thesis to transcend scales from masterplan to detail is reflected in the structure of this thesis.

Chapter 2

The research begins by framing the broad cultural background to suburban living and explains the issues faced by both city and suburban living. It shows us that integration of natural space is lacking and could be the answer to unhappiness issues in any built environment.

Chapter 3

The following chapter then picks up on Biophilia and Ecosystem Services Analysis (ESA). The former is a theory that all people are intrinsically linked to nature; the latter investigates the ecosystem of a site as a measureable provider of services such as drinking water, food, environmental filtration and cultural inspiration. The Ecosystem Service that is of most relevance is the ability to inspire and impact culture: a currently immeasurable quality. ESA stresses the importance of site specific response and suggests some formal responses to issues that arise in a case study.

Chapter 4

Investigation of Queenstown ensues; specific attention is paid to the economical, geographical and planning issues surrounding the site.

Chapter 5

A theoretical review of the ‘*Picturesque Beauty*’ and ‘*The Picturesque Movement theory*’ expands on Biophilia’s pragmatic notion that people have a profound connection to nature. ‘*Picturesque Beauty*’ is a manifestation of preference to environments that utilise natural phenomena, primarily *roughness* and *movement*.

Chapter 6

Precedents that use movement to create more efficient spaces are examined and critiqued alongside some that use movement for delight.

Chapter 7

The design iterations focus on developing a system of movement that is applied to a building to examine how it can increase efficiency of program, allowing connection to the outdoors and variety of space to be shared by rooms. Animations are used where necessary to diversify the design process and see the real transformation of the moving elements.

Chapter 8

A final design iteration is then worked into a developed design as a result of the testing.

Chapter 9

The final design is then propagated into a masterplan that occupies the site in a way that satisfies the ecological criteria and the success of the design is further tested.

Chapter 10

The exegesis then reflects on the success of the design case study and suggests a direction for further investigation.

Methodology

The thesis structure as it is presented is not an accurate reflection of the timeline over which it occurred; it is rather the clearest way that has been devised to present the ideas. Rather the design and research occurred simultaneously in the order presented, so if one were to transpose the design wing of the chart over the research wing, a more accurate picture would be achieved. The research was undertaken in this way to encourage a more fluid design led research process whereby one could influence the other. The critical reviews proposed new perspectives and these usually resulted in further research, but always prompted a new design approach.

THESIS STRUCTURE

Problem : Suburbia

This chapter aims to establish through research the mindset and issues that have created the problematic built environments we live in, gaining a realistic perspective on the limitations that are to be worked within. It serves as a broad introduction to the shift in density that is occurring and introduces the issues associated with both upwards and outwards development in response to exponential population increase. The mindset behind suburban living and the resistance to change is discussed within a New Zealand context alongside some of these issues. This chapter concludes by discussing the measures of density, their limitations and suggests the first parameter to defining success of both the design case study and other developments.

*“Sprawl, the pejorative but inescapable term for the low-density fragmented city that has become our culture’s characteristic form of urbanism”.*¹

Sprawl is the term given to the result of the automobiles and telecommunications supporting the division and fragmentation of the urban form, undoing the concept of the town centre that concentrated skills and population.² The suburb resulted, along with a population that has become attached to the concept of land ownership, facilitated by the automobile. The desire for land ownership further supports the sprawl of properties reaching as far as the eye can see, making way only for the transport networks connecting them and occasional sites of public amenity. This mind-set has created an “openness that is ubiquitous and oppressive”.³ The other side of this issue is that this space once belonged to an ecosystem and has now been manipulated to serve human will, while not necessarily improving quality of life. The solution to this did not take the form of a dense urban environment where “crowding was ubiquitous and oppressive”,⁴ rather to assess strategies to reach a suitable medium, while reintegrating the forgotten landscape. Zinnia Clark discusses how the catering of suburban design to the automobile and the individual, or nuclear family unit, establish it as “the antithesis of ecological and community-oriented living”.⁵ Banash and Enns epitomise Suburbia in a similar manner, claiming that “suburban communities represent a number of horrors from conformity and isolation to ecological devastation”.⁶

Maher and McIntosh suggest the path to solution of this issue while uncovering a range of motivators behind the suburban movement. The main issue

stems from the marketability of the private and possessive features, including square meterage and room numbers. This is perceived as what sells a house, so this is what is provided.⁷ The quality of natural setting is said to attract a price variance of 5-12% but this is a small fraction compared to the overall price of the house.⁸ This economy driven housing market leaves no room for the concept of community as it is unquantifiable in economic terms; hence people move to unfamiliar neighbourhoods due to cheaper sections and larger houses, thus furthering the isolation. Maher and McIntosh propose ‘sharing’ to solve this, which involves the careful facilitation of both community functions and privacy to ensure sustainable and efficient community development.⁹ They note that economy needs to give way to cultural capital in the debate on sustainable solutions. This is supported by the strong model of sustainability (figure 2.02) which suggests a reordering of values, suggesting that ecology is of the greatest importance as society can only exist within that, and economy the least as it is a fabrication of society.

Philip Morrison, a New Zealand based urban geographer, has focused on the ‘geography of happiness’ which is assessed primarily through surveys. He notes that “Until very recently, one’s understanding of the quality of life in a place was based solely on ‘objective’ secondary data from the census and/or physical measures of the local environment”.¹⁰ While he notes that the GDP and other such economic features do not reflect human happiness, there are many variables to accurately establish what contributes to subjective happiness. Morrison attributes peoples’ unhappiness to such things as: rapidly growing population, high housing

1. Fishman, 2005, p. xi.

2. Ibid.

3. Fishman, 2005, p. xiii.

4. Ibid.

5. Clark, 2000, p. 19.

6. Banash & Enns, 2003, p. 2.

7. Maher & McIntosh, 2007, p. 3.

8. Luttik, 2000, p.xi.

9. Maher & McIntosh, 2007, p. 3.

< LEFT.
Figure 2.02. Strong model of
Sustainability.

10. Morrison, 2011, p.1040.

11. Ibid.

12. Ibid. Article written prior to 2011 Christchurch earthquake.

prices, traffic congestion, and reduced access to services.¹¹ The feature that is scarcely mentioned when differentiating between cities is natural capital and how this affects people’s perception of happiness. When comparing Auckland and Christchurch, Morrison notes that Auckland is three times larger than Christchurch, is more densely populated, has more traffic congestion and higher housing prices.¹² It is not mentioned that Christchurch provides more natural capital per capita (see figures 2.03 and 2.05), so much so that it is termed ‘the garden city’. The following chapter will address access to public open space to deduce if there is any correlation between this and happiness.

Philip Morrison, whose focus is primarily on social and urban environments, omits discussion about green and public space. This is not taken into account by simple measures of density that cover the entire ward or zone of analysis. This is a limitation of his research that is accepting of the complex nature of a subjective topic while trying to measure it through objective means. While there are many variables to the measure of density, there are no global standards and the “more important issues of design quality are much more difficult to quantify”.¹³ There are many different ways to measure density and they can mean large discrepancies between different methods for the same location. Parcel Densities do not include footpaths; Block Densities do. Net Neighbourhood densities take into account land for residential use in a neighbourhood, whereas Gross Neighbourhood Densities include non-residential uses such as parks,

roads and schools. Results also vary in relation to family and unit sizes depending on whether Dwelling Units (DU’s) or Residential Population (RP) are being measured.¹⁴ While Morrison has drawn a link between density and subjective happiness, there is no assessment of the built environment quality or green space content.

A study completed for the Auckland Regional Council that measures the percentage of certain areas’ impervious surfaces supports Morrison’s findings while adding to the reasoning.¹⁵ It shows the areas of North Shore, Waitakere and Manukau City’s happiness may be influenced by the impervious surface content (figure 2.04). Alexander Stähle notes through use of ‘The Place Syntax Tool’ (PST) that some dense, urban environments have better access to public green space than low density residential environments.¹⁶ Peter Nunns notes that there is also a strong correlation between access to transport and happiness.¹⁷ He demonstrates through survey that

Territorial Authority	Average impervious	Uncontrolled happiness result
North Shore	0.32	0.117
Waitakere	0.20	0.266
Manukau	0.44	0.030

14. Ibid

15. Pairman et al, 2010.

16. Stähle, 2010.

17. Nunns, 2015.

<LEFT
Figure 2.04. Information Compiled from Morrison and Auckland Regional Council study of impervious surface coverage.

13. Forsyth, 2003, p. 2.

BELOW
Figure 2.03. Aerial Image of Christchurch City.

BELOW
Figure 2.05. Image of Auckland from One Tree Hill.

people in a New Zealand context would prefer to live in a place that gives them a diverse range of transport options. These examples of place measurement and happiness demonstrate the complex nature of defining success for a subjective matter; the limitations regarding quality for each method need to be understood.

While the automobile is responsible for dividing up lively city centres and propagating sprawl, the foray of issues that have followed has exacerbated the problem and established it as a preferable norm. Now as we look to reinvigorate the centres to mitigate the sprawling limits, we must consider how this more dense environment can become lively and pleasing. While there are many social features that Morrison discusses to enhance the understanding of factors that contribute to the success of a dense environment, we can see that there are two that can readily be designed for: public open space and the access to it, and access to transport options. Moving into design, the proportion of public open space will become an integral part of the assessment criteria, while density will define the success at a macro scale. Moving closer in, connection to these spaces, both physical and percieved, will be focused on and more design-based strategies will be used to avoid feelings of crowding.

Ecosystems

<OVERLEAF.

Figure 3.01. Author's own Image. Taken from walking track, Queenstown Hill.

The following research establishes the environmental criteria to which the proposed design adheres. It examines the link between the socio-cultural and environmental issues that are addressed by the final outcome. The focus in this chapter is on providing and preserving ecosystem services, and the tactics for outlining a masterplan, creating a successful context for design. The later chapter 'The Picturesque' shifts focus to the poetic and aesthetic relationships between the built environment, nature, and people.

Biophilia

Morrison notes two factors that contribute to mental unrest: crowding and anonymity.¹ Edward Wilson, an American Biologist, notes that there is a third: that humans are Biophilic by nature. Generally defined, Biophilia is a hypothesis that claims that humans have "the innate tendency to focus on life and lifelike process" and that "to explore and affiliate with life is a deep and complicated process in mental development."² This hypothesis states the importance of natural environments. The correlation between these three factors is that increase in density typically means a reduction of natural capital. One of the more adaptable concepts that Wilson notes is that of Ecosystem Services, that is the measurable functions that the ecosystem performs which facilitate life. The Ecosystem Services have recently been classified into three main groups: provisioning services, regulation services and supporting services.³ Wilson points out that "in 1997, a team of ecologists and economists estimated that the total services provided free by Earth's natural ecosystems is about \$33 trillion, more than the gross world product".⁴ There exists a fourth group that some sources omit: Cultural Ecosystem Services.⁵

Ecosystem services

Pedersen Zari uses Wellington as a case study to demonstrate how to define appropriate ecosystem services goals to be implemented within an urban environment.⁶ There is a distinct focus on vegetation used for sequestration of carbon to help regulate the climate. The outcome is that a developing forest sequesters far more carbon than a timber housing stock does and generally has a life expectancy of

around 300 years as opposed to 50 for a traditional house. This results in the design goal that Wellington needs "not to compete with the regeneration of native forest in terms of land use allocations and expanding urban areas".⁷ This could entail such design responses such as increasing vegetation in public parks, increasing the area of public parks, incorporating more vegetation into the urban fabric, but most importantly, consolidating the area of the built environment to allow for increased vegetation. The vegetation described provides not only for a means of climate control, but also has the capability to provide many of the ecosystem services simultaneously. There are seven of these that Pedersen Zari identifies as appropriate for inclusion in an urban setting: habitat provision (for wildlife), nutrient cycling, purification, provision of fuel/energy, provision of fresh water and provision of food.⁸ While these qualities are all very measurable, the focus in this design is on providing cultural services while allowing space for the other functions to take place.

Cultural Ecosystem Services.

Cultural Ecosystem Services are what an ecosystem provides to a culture; this can range from artistic inspiration to recreation education and cultural and spiritual practices. Most sources regarding ecosystem services accept the importance of cultural services^{9,10,11,12,13} but only a small few dwell on this aspect likely due to its immeasurability.^{14,15} The cultural benefits are currently classified as: tourism, recreation, aesthetic appreciation, inspiration and education.¹⁶ Jon Norberg and others argue that religion needs to be added to the list of immeasurable inputs.¹⁷ There is a strong link in many religions between nature and belief, and numerous studies linking mental wellbeing and the ability to access the natural world. As cultural services have such great variance, little definition or relevant goals are offered beyond establishing what they are. It is widely accepted that there is a strong link between cultural services and mental health, sense of place, social capital and social wellbeing.¹⁸ The answer lies in the specific site response, or a case study.¹⁹ The chosen site of the thesis is examined in such a manner.

1. Morrison, 2011, p. 1040.

2. Wilson, 1984, p. 1.

3. Pedersen-Zari, 2012, p. 2.

4. Penn and Mysterud, 2007, p. xiv.

5. Pedersen-Zari, 2012, p. 2.

6. Ibid

7. Pedersen Zari, 2012, p. 7.

8. Pedersen Zari, 2012, p. 3.

9. Chan et al, 2006.

10. Corvalán et al, 2005.

11. Costanza et al, 1998.

12. Pedersen-Zari, 2012,

13. Wallace, 2007.

14. Corvalán et al, 2005.

15. Wallace, 2007.

16. Corvalán et al, 2005.

17. Norberg, 1999, p. 190.

18. Corvalán et al, 2005.

19. Pedersen Zari, 2012, p. 57.

RIGHT.>
Figure 3.02. Estate Bungalow at
Matugama from above

Estate Bungalow

Narein Perera

Matugama, Sri Lanka.

120 m²

This house, located above a rubber-growing plantation and raised off the ground, demonstrates how a building can allow the site to permeate both under and through. The building being raised on steel columns allows the roots of the surrounding trees to grow without affecting the structure. This is a plausible solution for areas where forest needs to be given precedent. It poses issues, however, with regards to strength and cost.

RIGHT.>
Figure 3.03. Estate Bungalow at
Matugama from below

BELOW
Figure 3.04. Section produced
showing how building lightly
touches ground, allowing major
trees to root

Ecosystems

Anti-static

10

RIGHT.>
Figure 3.05. Image of the Hiroshi Senju Museum demonstrating how trees bridge form, making it disappear

Hiroshi Senju Museum

Ryue Nisjizawa

Karuizawa, Japan

This museum embraces the natural context by sloping the floor slab to follow natural contours of the site. The space is intended to make people feel as if they are in the surrounding forest. It achieves this by tree-filled penetrations. When these internal gardens are viewed from inside the museum, they act to bridge to the outer trees, making the opposite side of the museum disappear. This is a tactic that can be applied to a flat building, where a tree in the foreground can act to bridge visually to the trees behind.

RIGHT.>
Figure 3.06. Indicative plan produced of the Hiroshi Senju Museum.

RIGHT.>
Figure 3.07. Indicative section produced of the Hiroshi Senju Museum describing the effect of concealing form.

<OVERLEAF
Figure 3.08. Aerial imagery of Institute for Forestry and Nature Research.

<LEFT
Figure 3.09. Diagrammatic plan demonstrating how nature permeates facility.

RIGHT.>
Figure 3.10. Image of the Institute for Forestry and Nature Research.

IBN – Institute for Forestry and Nature Research.

Behnish Architekten

Wageningen, Netherlands

This research institute was designed to both integrate with the surrounding natural environment and be user friendly. It achieves this by breaking up the form with internal covered gardens and a green roof. The internal gardens allow every office to have a connection to a natural space. The only exception is the internal circulation which is fully internal apart from views at either end. This integration also works successfully for climate, reducing the ecological footprint of the building.

Conclusion

Biophilia proposes that humans have a love of the natural environment, and that this can provide direct physical benefits. Roger Ulrich notes studies that prove that patients heal more rapidly from surgeries when they have a view of a natural setting through a window.²⁰ Corvalán's studies indicate that change in ecosystem can have effects on livelihoods, income, local migration, and even political conflict.²¹ It follows therefore that a design for a home that maximises views to the natural environment, and encourages interaction with the natural environment, will also have benefits on physical and mental health.

20. Ulrich, 1984, p.2.

21. Corvalán et al, 2005, p. 2.

RIGHT.>
Figure 3.11. Image of the Institute for Forestry and Nature Research.

RIGHT.>
Figure 3.12. Image of the Institute for Forestry and Nature Research.
Figure 3.13. Image of the Institute for Forestry and Nature Research.

Picturesque Movement Theory

<OVERLEAF.
Figure 4.01. Author's own image.
Queenstown.

This research follows on from the research on Biophilia and Ecosystems to explore the aesthetic aspects of the thesis. It results in both poetic and pragmatic ways that the picturesque can influence the Cultural Ecosystem Services of the site while increasing the efficiency of the resource. It avoids the reliance on the quantity over quality of natural services and enables the viewer to perceive the greater interrelation with nature.

Early research in this thesis surrounding ecology and mental wellbeing resulted in the conclusion that the original site context prior to human habitation is the most ideal. The research showed why facilitating a Biophilic relation with nature and reducing impervious surfaces create a healthy environment and healthier and happier humans while strengthening economy. There are also poetic reasons for this which Kellert and Wilson neglected to discuss to avoid a “disguised attempt to promote a romantic idealization of nature”.¹ This chapter discusses one of the theories that explores this link, ‘picturesque beauty’.

The Picturesque Theory

Surfacing historically as a language of design in the 18th century, William Gilpin is accredited with the conception of ‘picturesque beauty’, a medium between the ‘beautiful’ and the ‘sublime’.² As opposed to ‘beauty’, which pleases the eye in its natural state, ‘picturesque beauty’ offers a pleasing quality that may be illustrated.³ It is stressed in Gilpin’s writing that ‘roughness’ is the key distinguishing feature between ‘beauty’ and ‘picturesque beauty’.⁴ Where a scene is nothing but featureless smoothness, a rough element can be added to contribute to the picturesque beauty; if it be a smooth, rolling knoll, it can be interrupted by a large oak.⁵ There are more of these dualities described that should constitute a picturesque painting and all describe a quality that is constant in nature. These dualities include: simplicity and variety, light and dark and cohesion and contrast.⁶

Joshua Reynolds mentions how these characteristics describe the difference between Peter Paul Rubens (figure 4.03) and Michelangelo (figure 4.02):⁷ he notes that Michelangelo’s painting style, while beautiful, is not picturesque. His painting, *The Deluge* is painted in a style where skin tones are smooth, the water reflects nothing, and all outlines

of the figures are definite. Though it is ‘beautiful’, Reynolds argues it is not picturesque, and does not depict a natural reality. One century later, the painting by Rubens contains rough figures, where outlines are less definite, though a striking contrast is maintained between the supporting figures and the main character. In this manner, the control of light and dark, smooth and rough, contrast and variety give the painting greater realism and natural impression. This is reaching towards ‘picturesque beauty’, where the natural qualities are observed and expressed to give the painting a more honest appearance.

Since its definition in the 18th century, the theory of ‘picturesque’ grew from a pictorial language into something that “provided the remove by which gardening could be understood to be an art imitating, rather than merging with nature”.⁸ This is contrary to the opinion of 19th century painter and theorist John Reynolds who condemns the “vulgar idea of imitation”.⁹ Though this discrepancy is minor, it is imperative to ascertain what is being

8. Macarthur, 2013, p. 5.

9. Reynolds, 1842, p.26.

<LEFT.
Figure 4.02. Section of
The Deluge (1508-12) by
Michelangelo di Lodovico
Buonarroti Simoni.

<LEFT.
Figure 4.03. *Pythagoras
Advocating Vegetarianism*
(1618-20) by Peter Paul Rubens

1. Kellert & Wilson, 1995, p. 21.

2. Gilpin, 1792, p. 42.

3. Ibid, p.2.

4. Ibid, p. 6.

5. Ibid, p. 8.

6. Ibid, p. 20.

7. Ibid, p. 35.

RIGHT>
Figure 4.10. Wimpole Estate
folley

*We call the ragged beggar, with his weather-beaten hat and gaping shoes, a picturesque figure, while the boots and hats which have just come out of the shop are regarded as unpicturesque. They lack the rich, rustling life of the form which we might compare to the ripple of the waves when a breeze ruffles the surface of the water.*¹³

Site

The picturesque promotes a shift in thinking about the way an entire site is conducted. In the islands that we see in suburbia, people have their own style and size of building and a cultivated, token effort at having a garden. “In the theory of urban design as it developed throughout the nineteenth century, the emphasis gradually shifted from how a building could make use of the greater site beyond the property boundaries to how a building could change and inflect the whole “Townscape.”¹⁴

The idea of the picturesque threatens to dissolve the edges of the matrix that has been defined by site boundaries and linear infrastructure such as roads and pathways. The uncontrollable aspect of nature will be allowed to come flooding in to offer the site

<LEFT.
Figure 4.11. Survey-produced
image of Wimpole Estate folley
form.

a new beauty: one of engagement as opposed to control - removing the hard surfaces and definite boundaries to shift from natural elements contained within ever shrinking sites to expansive sites without definite boundaries, contained only by nature. This may contrast the view of picturesque as frames and controls through the cultivation aspect of gardening but proposes that the theory is not merely the creation of “a picture ... cut from its context by a frame and made on a transportable surface”,¹⁵ but that the site and an object’s engagement with it is in fact what is central to the idea of the picturesque. While it is possible to view something picturesque through a frame, it may be argued that something is not truly picturesque if it does not somehow interact with its context.

This intention to create a design that is picturesque in the manner stated above will help the design answer the question of how rethinking the suburban form can produce a more picturesque and integrated environment. The intention is to not hide the density but to allow it to be enriched by interconnection between people and nature.

15. Macarthur, 2013, p. 53

BELOW.
Figure 4.12. Suggested outline
of folley before (implied)
destruction.

RIGHT>

Figure 4.13. Highclere Castle Estate's folley viewed from the tower. Framed by the landscaping.

The Picturesque-movement effect

Within the realm of the picturesque, there are two ways of addressing the fourth dimension of time that are commonly discussed: these are 'movement' and "motion". They describe the difference between a non-subject dependant form of movement and a subject dependant form of motion.¹⁶ They are particularly relevant to a design that moves and has a considerable pallet of vistas to frame.

Movement

Wölfflin's theory of movement describes how movement can be captured or implied to contribute to the picturesque of a scene. Macarthur summarises that "the 'picture' in Picturesque implies that movement is not the experience of being moved, but of the image of motion".¹⁷ Robert Adams is quoted as stating that "movement is meant to express, the rise and fall, the advance and recess, with other diversity of form, in the different parts of a building, so as to add greatly to the picturesque of the composition".¹⁸ These are resonated by Wölfflin's principles of opposing concepts: linear and painterly, plane and recession, closed and open forms, multiplicity and unity, clarity and unclearness.¹⁹ And also by Gilpin's dualities of rough and smooth, light and dark, simplicity and variety, cohesion and contrast.²⁰ This area also dispels imitation, in that anthropomorphism is weak and underdeveloped. Macarthur suggests that proportion does not relate

16. Macarthur, 2002, p. 137.

17. Ibid, p. 143.

18. Ibid, p. 152

19. Ibid, p. 143.

20. Gilpin, 1792, p. 40

<LEFT.

Figure 4.14. Highclere Castle viewed from behind folley.

to human form, but rather to things like rate of respiration, eye movement and attention.²¹

21. Macarthur, 2002, p. 143.

Movement and Biophilia

Wölfflin describes the "freely moving forms of nature" in his writing on principles.²² This results in the impression that nature is a constantly moving entity; an object can have the above mentioned techniques applied to it and it shall become picturesque. To reach the essence of the statement, it must be asked what the movement is that nature possesses. It could be argued that nature is in a state of constant flux and it is implied that if an image were to be generated, it would be of a gesture that demonstrates the temporal nature of the elements-whether it is via evaporation and rainfall creating rivers, tectonic movements creating mountains or the orbit of the moon creating tides.

22 Wölfflin, 1950 p. 24.

The foremost application of this theory to design could simply be through the thoughtful incorporation of natural elements such as trees and topography. However, to extend this theory into architectural practice the use of material and form can be applied in such a way to create a gesture and give the building a semblance of movement. Specific to this design will be the inclusion of moving façade parts to express the actual movement within the building whether it is seen in motion or in different poses.

Motion

‘Motion’ is a separate term from ‘Movement’ as “Motion through the spaces of a building opens the temporal dimension by giving an apprehension of form to the duration and succession of spatio-visual experiences”²³ whereas ‘Movement’ needs only to give a semblance of actual movement. Macarthur describes the reality faced by architecture, or any inhabitable spatial design discipline, that people are not static viewpoints. This is similar to Pevsner and Aitchison’s view on how the inhabitants experience places as a sequence of spaces and views. He describes this as how visual impression is “composed by the sequential attention of the moving spectator”.²⁴ This challenges the conventional view of the picturesque by offering the opportunity for there to be more than one object and more than one ‘picture’ of that object.

Conclusion

Proposed here are opportunities for a series of changing viewpoints - not just one set framed view, but a series of unfolding tableaux. These moving, changing viewpoints are available not only outside, but also inside - not only horizontally but vertically. The design chapters explore movemnt within the traditionally static form of the house and apply the dualities that have been discussed.

23. Macarthur, 2002, p. 138.

24. Pevsner & Aitchison, 2010, p. 20

Context : Queenstown

<LEFT.
Figure 5.01. Author's own image
taken from Queenstown Hill.

“Subdivision is the primary reason why the network is expanding. Unrealised or partially realised subdivision potential around the fringes of settlements threatens the ability of the public sector to maintain infrastructure without a decline in overall level of service to some communities.”¹

1. Otago Regional Council, 2011,
p.21.

Queenstown's Population

A transient town that has thrived off action tourism and has undergone consistent growth since its success and popularisation, Queenstown's resident population has swollen from 22,956 to 28,224 in the past 8 years.² The town has an additional visitor population that ranges from 18,172 to 60,906 in peak times.³ By the year 2031, visitor and resident numbers are expected to grow by 144% to a total population of 44,093. While the town has year round tourist attractions, including wineries and ski fields, the development boom Queenstown is experiencing is a compound dynamic including

2. Statistics NZ, 2015.

3. Ibid.

RIGHT.>
Figure 5.02. Location of Otago
and Queenstown within New
Zealand.

commercial, residential and tourism.⁴ At the current growth rate, Queenstown will double in population every 20 years, creating substantial pressure for the town to develop.⁵ A lack of housing and land in the Queenstown centre is causing up to 30 workers to be sharing one single house.⁶ Although it is unclear whether this is due to budget or availability constraints, there are many issues surrounding these tenancies such as unhealthy living conditions and disputes with 'slumlord' landlords.⁷

4. Ash, 2016.

5. Ibid.

6. Hathaway, 2015.

7. Edens, 2015.

Current Solutions

The Government's current response to the problem is a call for more housing in satellite towns. The Labour party is advocating for 1000 more affordable houses for the district in the next ten years through the Kiwibuild policy.⁸ The current Government has announced its intention to build 1300 new houses in the next three years in 'Special Housing Areas' in the Wakatipu Basin. This proposal includes "390 residential units at Homestead Bay, next to Jack's Point; 95 lots at the new Shotover Country subdivision; up to 150 homes at Ayrburn Farm on the Arrowtown-Lake Hayes Road and up to 150 dwellings on the Frankton-Ladies Mile Highway" which are all satellite towns (figure 5.03).⁹ This approach is contradicted in a report by the Otago Regional Council on transport issues that notes "Subdivision is the primary reason why the network is expanding. Unrealised or partially realised subdivision potential around the fringes of settlements threatens the ability of the public sector to maintain infrastructure without a decline in overall level of service to some communities".¹⁰ Ash notes that Queenstown needs to develop upwards and focus on medium and high-density developments to ensure against landscape degradation.¹¹

8. Jamieson, 2015.

9. Ibid.

10. Otago Regional Council,
2011, p.21.

11. Ash, 2016.

<LEFT.
Figure 5.03. Expansion of
Queenstown built area

Decentralisation and Demographics

There is a persistent drive in this area for free-standing, single family dwellings on a quarter acre section.¹² This is causing a decentralisation of the town’s mass that has seen many satellite green-field developments occurring (figure 5.03). Jenks et al. note that there is no stopping greenfield development¹³ and Queenstown will become an extreme example of this with the large, relatively flat expanse of farmland just behind Queenstown Hill if land use is not more stringently controlled. This will result in a loss of the rural character of the town.¹⁴ The current CBD is relatively small and bound by hills. The predominant housing type is single detached dwellings, 40% of which are likely to be holiday homes ¹⁵ that remain unoccupied for the majority of the year. Densification of the current town area will improve the vibrancy of the town and be more inclusive of residents and seasonal workers, who make up the majority of the town’s character. The “Economic Futures Taskforce” report contrasts this by stating that there is a need to lock in a market and accommodation for the upper-echelon, “high quality” customers.¹⁶ While this may be good for the economy, it also means many unoccupied houses in a town in which it is difficult to find accommodation.

Infrastructure

Queenstown’s infrastructure has been developing in response to its demand. There are two roads that connect Queenstown and Arrowtown. The primary of these roads also services traffic bound for Lake Hayes Estate and Cromwell and are subject to high traffic flows and congestion. There is busses that link all the major satellites (figure 5.04) and all the ski mountains (figure 5.04) that run on a half-hourly basis making public transport a viable option.

BELOW.
Figure 5.04. Bus routes
conneting Queenstown and
sattellite towns.

ABOVE
Figure 5.05. Bus routes
connecting Queenstown and ski
fields, site shown in red.

12. Ibid.

13. Burton et al, 2003, p.31.

14. Ash, 2016.

15. Statistics NZ, 2015.

16. Van Uden, 2012, p.11.

Queenstown Hill Suburb (Chosen site)

- Current population 726
- Hillside location, southeast facing.
- Cul-de-sac network.
- Traverses hillside.
- Favours vehicular transport.
- Majority stand alone dwellings and low rise visitor accommodation.

City Centre

- Current population 3,645
- Small area of flat land, surrounded by hill.
- Public amenity buildings; shops and restaurants all surrounded by hotels and housing.
- Gridded network with pedestrian bias in few areas.

Lake Hayes Estate

- Current population 1,638
- New subdivision in quarry-made hollow
- Cul-de-sac street network.
- All detached dwellings.
- Entire population forced through bottleneck (top left).
- Satellite development.

Arthurs Point

- Current population 810
- Satellite town
- Home to the Shotover Jet
- All detached dwellings

RIGHT>
Figure 5.10.

Fernhill Suburb

Current population 2,355
-Hillside suburb that houses a large proportion of the travelling and working population of Queenstown.
-Older housing stock, home to the Castle of Frenhill, a characteristic 30 person flatshare.

RIGHT>
Figure 5.11.

Arrow Town

Current population 2,445
-Satellite town on opposite side of Wakatipu Basin to Queenstown.
-30 minute drive from Queenstown, on bus route (see figure 5.04).
-Inefficient road network, low traffic.
-Town bound by river.

<LEFT.
Figure 5.12.

Jacks Point

Developing.
-High end residential, some working, some retiree, some holiday homes.

<LEFT.
Figure 5.13.

Town infrastructure

The surrounding satellite towns are shown here to a relative scale. It can be seen that they all respond to the form of the land, creating an organic appearance. These cul-de-sac forms that all the towns exhibit pose great inefficiencies when travelling both by car and foot. They force people to have to walk a greater distance to get to nearby amenities, such as bus stops, hence shifting the preference to vehicular transport. Peter Nunns notes that people are much happier when they have equal access to all forms of transport.¹⁷ They also concentrate traffic to certain areas and roads, such as in Lake Hayes Estate where the growing 1600 person population exits the neighbourhood through one road. This causes congestion and noise for the people along this road. Above can be seen the correlation between this road layout and the increased popularity of the automobile (figure 5.13).

17. Nunns, 2015.

^ABOVE.
Figure 5.14. Mass of built
environment Queenstown (red)
within the Queenstown Urban
Area.

BELOW.
Figure 5.15. Population
distribution Queenstown.

^ABOVE.
Figure 5.16. Distance from site to
town centres, Queenstown : 2.3
km, Frankton: 3.7 km

BELOW.
Figure 5.17. Distribution of
various accommodation types
within Queenstown.

RIGHT.>
Figure 5.18. Possible links from forest to sea that can be bridged by pedestrian walkways and extensive planting. Following the form of natural valleys.

RIGHT.>
Figure 5.19. Extension of walk to public transport caused by inefficiency of a road-only network.

RIGHT.>
Figure 5.20. Demonstration of existing houses on site's outdoor area, deck area and main window aspect from inside to outside of circular scale.

<LEFT.
Figure 5.21. Location of site within urban form of Queenstown (shown in red).

Project Description

The area in focus (figure 5.21) was chosen as it is a problematic site due to its hillside location and southeastern aspect. This poses specific design challenges that are currently responded to by single family, south-facing houses, which echo the district plan's designation of the area as low density residential. The area of land is currently under gradual suburban habitation as it is a recently opened site. Land plots have been allocated but are far from full; this makes it possible to accurately project the maximum housing capacity of the site. This is projected as 8 dwelling units per hectare, a population of 748 based on an assumption of two people per room. It is likely that 40% of these homes will become semi-occupied holiday homes.¹⁸ The population flux of Queenstown is the most salient feature at this present time and a building stock that can reflect this poses an interesting design problem. The seasonal workers are the driver of this flux, and currently live in variable conditions^{19, 20} so shall be given precedent. They are also living in a condition where 'sharing'²¹ is necessary but would occur as an afterthought in a 'shared house', which may have up to 14 rooms.²²

18. Statistics NZ, 2015.

19. Jamieson, 2015.

20. Edens, 2015.

21. Maher & McIntosh, 2007, p. 3.

22. Edens, 2015.

31
Anti-static | Location : Queenstown

POPULATION
748
PROJECTED SUBURBAN MODEL
ASSUMING AN AVERAGE OF TWO PEOPLE PER ROOM
OR 68 PEOPLE PER Ha
OR 8 DU's PER Ha

Precedent Study

<OVERLEAF.
Figure 6.01. Author's own image
Queenstown.

RIGHT.>
Figure 6.02. Casa MJE rotating
walls in operation

Area: 70 m²
Occupants typical: 2
Occupants max: 5
External connection: windows
Circulation: open
Movement system: rotating wall
Density (typical): 0.03 pp/m²
Density (max): 0.07 pp/m²

<LEFT.
Figure 6.03. Casa MJE rotating
walls in operation

Casa MJE

PKMN Arhitects

Mexico

Casa MJE house designed for two grandparents to accommodate their children and grandchildren when they come to visit. The space transforms by means of rotating walls that house storage and functions such as guest bedrooms and sofas. The design is easily operable by the elderly occupants. The house, while it has much flexibility of space, has no variety of space. The rooms that result are all the same height; this is mainly a product of the apartment retrofit, but it could be pushed to have differing floor heights to articulate the space more effectively.

RIGHT.>
Figure 6.04. Plan produced of
Casa MJE.

RIGHT.>
Figure 6.05. Inhabitation of the Suitcase House

<LEFT.
Figure 6.06. Design team and inhabitation of the Suitcase House

Suitcase House

Gary Chang
Nangou valley, Beijing, China

Designed as a holiday retreat that can comfortably house up to fourteen people, the suitcase house reflects the aim of this thesis to create an inspiring space that can house a variety of people and functions. The house consists of a main floor that can become a completely flat plane and a half level below that is accessed by pneumatic doors at various points to create different spaces.

Precedent Study

Anti-static

BELOW
Figure 6.07. Diagram of openings in the floor of Suitcase House

BELOW.
Figure 6.08. Plans of various configurations of the Suitcase House.

RIGHT.>
Figure 6.09. Inhabitation of the Naked House

Area: 95 m²
Occupants: 5
2 x parents
1 x grandparent
3 x children
External connection: both ends
Circulation: open
Movement system: rolling boxes
Density: 0.053 pp/m²

RIGHT.>
Figure 6.10. Plan of the Naked House.

<LEFT.
Figure 6.11. Inside the Naked house

Naked House

Shigeru Ban
Saitama, Japan

A house for a family of 5 including two children and a grandparent, this house is a facilitator of family collaboration. The rolling boxes allow the 'rooms' to be reconfigured and closed off as desired. Circulation space is dynamically used by all programs of the house creating interesting and changing spatial relationships. Inhabitation on top of the 'rooms' allows for more spatial variety.

While this house has great variety of application, it would be unsuitable for a western household due to the overwhelming lack of privacy and sleeping arrangement. Japan's use of the Tatami for sleeping and walking allows maximum flexibility of space.

The layers of inhabitation in this house work successfully; however, the large space would be inefficient to heat in Japan's cold winters.

RIGHT.>
Figure 6.12. Gary Chang's Hong Kong Apartment folded away.

Area: 32 m²
Occupants typical: 1
Occupants max: 2-3
External connection: 1 window
Circulation: open
Movement system: sliding wall
Density (typical): 0.03 pp/m²
Density (max): 0.06 pp/m²

<LEFT.
Figure 6.14. Library stack systems rolled out.

Transforming Apartment

Gary Chang
Hong Kong

Originally the house that he grew up in with his family, Chang has reappropriated the house as a 'bachelor's pad'. A sliding unit system similar to a libraries' stacks reveals rooms of different functions within the same overall space. A kitchen, bath, guest bed and more are hidden within the units.

While Chang achieves a variety of spaces and applications, there is a lost opportunity that could be achieved by sharing a space with more people, sharing the facilities that have become dead space.

RIGHT.>
Figure 6.13. Plan of the Gary Chang's apartment indicating movement

RIGHT.>
Figure 6.15. Library stack systems in Casa De Yolanda occupied by visitors

Casa De Yolanda

PKMN Architects
Madrid, Spain

Utilising a similar system to Chang’s apartment, the library stacks are designed specifically around the possessions that Yolanda owns. This apartment is divided into two halves: one that houses all the function, and one that is an entirely flexible space. This apartment achieves no greater efficiency in terms of inhabitation per square metre; however, it is a more dynamic space and allows the house to configure around the owner. Yolanda is able to configure the space as she feels around her activities.

RIGHT.>
Figure 6.17. Library stack systems opening for visitors in LifeEdited Apartment.

LifeEdited Apartment

Catalin Sandu and Adrian Iancu
New York City, New York

Similar to the other two designs that utilise the library stack system. Rooms expanding horizontally.

<LEFT.
Figure 6.16. Casa De Yolanda under normal occupation.

<LEFT.
Figure 6.18. ‘LifeEdited’ apartment ready for maximum occupancy.

Design Tests

The design process involved three key stages, the first was to come up with a new masterplan, after which specific buildings within that were investigated. The designs developed a system for movement that was tested through its application to a complete building. A new design was produced for each review that responded to the strengths, weaknesses, opportunities and threats established in the previous review. The final design is a culmination of the design testing and responses that satisfies the established parameters.

BELOW.
Figure 7.02. Process diagram for
developing system

The first iteration examines the viability of an existing system to create varieties of spaces that have the ability to change to suit the needs of the occupants. It utilises the rotating wall system seen in the example ‘Casa MJE’ by PKMN Architects.

Efficiency

The aim is to achieve the maximum use of the building area at all times of the day. This design achieves the maximum usage of the space, however, it has no specific intention for the use of these spaces, other than expanding the living areas from small to generous. This does allow for many possible activities, but does not propose any specific use.

Spatial variety

The rotating wall system relies on a flat floor with a consistent ceiling height. This does allow for spatial variety in plan but not in section. This means that all rooms and programs have to adhere to the same room height.

Connection to outdoors

The overall mass of the building works to sequester natural land in a way that cannot be infilled. It also allows all the units to have equal access to a view, direct sunlight and natural light, however due to the partial submersion of the units and their orientation, there is only a small connection to the physical setting. The main outdoor space is found on the balconies that make use of all the roof space of the building, however the balconies act to block the lower half of the view on this aspect of each unit.

Gross floor area (m²)	172
Building footprint (m²)	105
Building volume (m³)	447
Occupants (max)	8
Occupants / m² gross	0.05
Occupants / m² footprint	0.08
Occupants per m³	0.02

BELOW.
Figure 7.03. Overall form of
apatment.

- 1 Kitchen
- 2 Toilet
- 3 Bedroom
- 4 Sitting room
- 5 Deck
- 6 Bathroom
- 7 Storage/laundry
- 8 Master Bedroom
- 9 Bedroom
- 10 Bedroom

^ABOVE.
Figure 7.04. Plan of initial
apartment design in normal use

- 1 Kitchen
- 2 Toilet
- 3 Lounge / Dining
- 4 Deck
- 5 Bathroom
- 6 Open Space

^ABOVE.
Figure 7.05. Frames of animation
of initial apartment design.

13.

14.

15.

16.

17.

18.

19.

20.

21.

22.

23.

24.

DESIGN ITERATION TWO

Gross floor area (m ²)	1434
building footprint (m ²)	717
building volume (m ³)	5162

Occupants (max)	96
-----------------	----

Occupants / m ² gross	0.07
Occupants / m ² footprint	0.13
Occupants per m ³	0.02

This design introduces a system that involves floor plates with the capability of moving up and down to reveal different room configurations. The system works on the basis that the fit out is capable of folding down into a compact unit so that three rooms can be reconfigured over a double height space as needed. It responds to the criticism from the first review that there was little reason for the reconfiguration of the spaces. It creates both spatial variety and efficiency.

Efficiency

This design is a slight reduction in efficiency in terms of three dimensional space. However it does allow for any particular space to become either a double room, a bunk room, a kitchen, a living room or a flexible space as necessary. The current configuration requires a lot of circulation space that is essentially dead.

Spatial Variety

The rooms being configured over a double height space with two adjoining units horizontally means that more spatial variety is achieved. Communal activities can occur in double height spaces when the occupancy allows, but this space is not permanently dedicated.

Connection to the outdoors

The room units are currently separated from the outdoors by a 2 metre wide circulation space that serves as a balcony by means of large openings in the façade. This creates internal rooms which are highly unfavourable; however, these are not permanent rooms and therefore some of the pitfalls are overcome.

<LEFT.
Figure 7.06. Site plan of buildings
within overall site

<LEFT.
Figure 7.07. Site plan. Blues
building investigated in this
iteration.

<LEFT.
Figure 7.08. Axonometric of first original system of movement.

BELOW.
Figure 7.09. Sections and plans of different possible configurations of units.

DESIGN ITERATION THREE

Gross floor area (m ²)	147
Building footprint (m ²)	113
Building volume (m ³)	672

Occupants (max)	12
-----------------	----

Occupants / m ² gross	0.08
Occupants / m ² footprint	0.11
Occupants per m ³	0.02

This design develops on the previous system. The vertically moving units become the nucleus of the house's functions; the kitchen and bathroom are fixed entities that rely on the reconfiguration of the room units to provide the larger communal spaces. The main critique this design addresses is to clarify the intentions of the previous system while exploring another typology.

Efficiency

The fixing of the kitchen into each unit of this design and the integration of a larger balcony renders it slightly lower in efficiency than the last design; however there is less space lost to integrating

complex circulation. The building is also raised up at the front to allow for parking to occur under the building, reducing the impervious surface of the site.

Spatial variety

The double height space is used in a very similar way, but the functions of these spaces are now more definite. Lounge type spaces occupy the tops of the units when they are folded down and they are divided up by the units. There can be a double length lower space, a double length upper space, or a separate double height rear living area as seen in figures 7.16-7.22.

Connection to Outdoors

The connection to the outdoors is now addressed in a more effective manner. The front is still highly focused towards the view with a balcony that can become an internal lounge or dining area by means of the large rotating wall at the front. The rear of each unit touches down to the park space contained and shared by the perimeter block style buildings.

<LEFT.
Figure 7.10. Site plan of new building design (detailed).

<LEFT.
Figure 7.11. Impression of second original system design.

^ABOVE.
Figure 7.12. Ground level plan

<LEFT.
Figure 7.13. First level plan

RIGHT.>
Figure 7.14. Interior of space
created when units folded away

<LEFT.
Figure 7.15. Impression of
second original system design.

^ABOVE.
Figure 7.17. Sequence of moving model of one room unit that collapses down into itself.

Figure 7.16. All units folded away. Double height space beneath.

Figure 7.18. All units folded out. Maximum occupancy

<LEFT.
Figure 7.19. Junction at each corner of unit, worm-drive system moves unit up and down.

Figure 7.20. Bottom units folded out. Floating lounge on second storey.

Figure 7.21. Front units folded out. Separate lounge at rear.

Figure 7.22. Top units folded out. Open floor beneath.

ANIMATION STUDIES

^ABOVE.
Figure 7.23. Design of how room contents
can move independantly of walls

DESIGN ITERATION FOUR

Gross floor area (m ²)	621
Building footprint (m ²)	235
Building volume (m ³)	1738
Occupants (max)	48

Occupants / m ² gross	0.08
Occupants / m ² footprint	0.20
Occupants per m ³	0.03

This design utilises the same system as the previous two, but it is integrated differently to the building. The units in these floors have been redesigned to act as mediators between the interior and exterior of the building. The units are connected to a central circulation space that they are able to spill into when they are used for a communal function. It responds to the criticism that the picturesque and movement theory were not being expressed in the building.

Efficiency

Same gross efficiency as the previous design, but greater volumetric efficiency even though the building is taller. The efficiency is improved by sharing a larger kitchen and bathrooms between more people. The generous communal walkway that connects the units acts as a multifunctional space that can be used to expand the individual units. The circulation in this building has been optimised further than the last iteration.

Spatial variety

The communal walkways act as a series of transforming spaces that are similar in plan but will vary greatly depending on occupancy. They can be closed rooms, communal extensions of the walkway or completely removed for a direct connection to the outdoors.

Connection to outdoors

The units acting as a mediator between inside and out means that when they are full of people, the view is only seen from the communal circulation between them; different view shafts are articulated by the changes in occupancy of the building. The units allow for views through double height spaces from the upper floor to the lower floor and the landscaping surrounding the building rather than cropping the views all the time. The units also allow the edge to become either a bedroom unit or a balcony / outdoor unit as required.

Figure 7.24. Plan ground level.

Figure 7.25. Plan first level.

Figure 7.26. Plan second level.

^ABOVE.
Figure 7.27. Complete system in
site (closed)

^ABOVE.
Figure 7.28. Complete system in
site (open)

RIGHT.>
Figure 7.29. Internal use of
building (winter)

<LEFT.
Figure 7.30. Fluid use of building
(summer).

Final Design

Gross floor area (m ²)	557
Building footprint (m ²)	279
Building volume (m ³)	1838
Occupants (max)	72
Occupants / m ² gross	0.13
Occupants / m ² footprint	0.26
Occupants per m ³	0.04

The final design occupies the same site as iterations three and four. It is in essence a synthesis of the two; it fuses the individual unit style of the third with the communal layout of the fourth. It has a combination of internal and external moving units to mediate between inside and out and also to divide up the interior spaces, acting as the divider between the units.

^ABOVE
Figure 8.02. Ground level plan.

^ABOVE
Figure 8.03. Upper level plan

RIGHT>
Figure 8.04. Proprietary generic Worm-drive system in H-configuration

<LEFT
Figure 8.05. Proprietary generic Worm-drive system driver.

Above (figure 8.04) shows a standard screw-jack or worm gear system and one of the components commonly used. They are a simple system consisting of one motor and four drives. They have a capacity of 250 Kilograms to 100 tonnes and examples of systems researched have a use frequency of anywhere between once a month to 6 hours a day, five days a week. Below is the design of how this system will be integrated into both floors and ceilings of the three by four metre units that are the bedrooms and extensions of the communal spaces. The units are in both the floor and ceiling of the units so that they can move independently of each other and can be removed and replaced as a complete unit. The worm drive works slightly differently to the one pictured in that the drivers move the unit they occupy, rather

than moving a separate entity. There is no difference in the overall application however. The four drives attach to columns that house the shafts, with specifically designed attachments.

It is intended that the units will only change with the occupancy of the building; for example, when a couple leaves and a group of 2-4 people arrive, a double room can be replaced by a 4-person bunk. If nobody is there to replace the people as to leave immediately, the remaining occupants can use the space as a balcony or as an extension of the living area. If the building is at maximum capacity, rooms can be reconfigured as they are occupied; so if all the occupants are not sleeping, the room can be converted into a communal area.

<LEFT
Figure 8.06. Exploded axonometric of design for movement system integrating proprietary system.

FAR RIGHT>
Figure 8.07. Corner detail of how
prioetary system meets column
at one of four corners of each
unit.

The figure to the right shows a single column
junction with the ceiling and floor of a room unit.
The construction for the ceiling is the same for the
floor as it is designed to be inhabited when the rooms
are not in use. At the junction, there are two channels
for the unit to connect: one for the axle to drive the
unit up and down, the other for the cleat to hold the
weight; of the unit so the axle bears no weight, this
will ensure a longer period between servicing by
reducing strain. Below are the plan and elevations
of the system, describing how the H-type system sits
typically within the system. There are other slight
variations due to the configuration of the columns.

The following page shows the two rooms that have
been designed to fit into the system. They are a
double room with a desk and shelf system, and a four
person bunk room where personal belongings will
be stored under the bed or on the opposite wall. All
of the furniture within the rooms has been designed
to fold down to 200mm thick by the motion of the
system. Unlike previous designs, the walls are not
integrated into the folding system. Rather, where the
unit is not against an external wall or shelving system,
there are sliding partitions that act as the entrance to
the rooms also. There are infinite other possibilities
for what functions the stacking room system could
house, but for the purposes of satisfying the design,
the maximum and minimum densities of beds have
been designed in order to test efficiency. The main
intention for the design is that they can be folded
away to nothing, allowing for maximum possible
space for activities; this is condoned by Gary Chang,
who favours empty space as it enables possibility.

FAR RIGHT>
Figure 8.08. Plan and elevations
of system showing placement of
parts within units.

BUNK UNIT

Final Design.

^ABOVE
Figure 8.12. Plan of bunk unit design, dotted lines represent folded down position

BELOW
Figure 8.13. Axonometric of unit design

Anti-static

61

Figure 8.09. Unit fully folded out

Figure 8.10. Unit half unfolded

Figure 8.11. Unit fully folded down

DOUBLE UNIT

Figure 8.14. Unit fully folded out

Figure 8.15. Unit half unfolded

Figure 8.16. Unit fully folded down

61

Anti-static | Final Design.

^ABOVE
Figure 8.17. Plan of double unit
design, dotted lines represent
folded down position
BELOW
Figure 8.18. Axonometric of unit
design

THREE UNITS PER SYSTEM, NINE POSSIBLE CONFIGURATIONS

BELOW
Figure 8.19. Different configurations of units.

Top bay occupied by double room, lower bay occupied by bunk room

Top bay occupied by double room, lower bay empty

Top bay empty, lower bay occupied by double room

Top bay occupied by bunk room, lower bay empty

Both bays empty and stacked middle unit moves to top creating double height space

<LEFT
Figure 8.20. Exploded
axonometric showing structure
and fixed floor layout.

RIGHT>

Figure 8.21. Section perspective showing the action of sliding walls that separate public and private.

RIGHT>

Figure 8.22. Key plan showing where sectional perspective is located.

Sliding Wall System

Each room has a sliding wall that acts as the entrance and also to expand the living areas when the rooms are not in use. The walls are carefully designed to slide out of the way, either flush to an external wall or beside a stair. The other function of these sliding walls is to connect the three main living areas on each level when the adjoining rooms are not in use. This move was inspired by the generous circulation of iteration four.

Structure

The structure is comprised of steel frames that support a timber structure. The main structural element is the room stacking systems. As they have a very low tolerance for movement, the systems are made from essentially portal frames. These units are wide spread and sturdy enough that the rest of the structure, which is all timber frame, is able to span between and cantilever off the systems. They will be able to be specified on a case-by-case basis to transfer all the transverse and gravitational loads to the ground.

<LEFT

Figure 8.23. Plan demonstrating where moving units are located within building. Shown in red.

RIGHT>

Figure 8.24. X-ray axonometric showing location of movement within building.

Seen above is the location of all the room stacking systems; there are nine in total and they are all essentially the same in construction. They all contain three rooms that are configurable across two stories as seen in figure 8.19. The way that they differ is by their location within the building and hence the amount they mediate between interior spaces or between interior and exterior.

The systems on the western side of the building are the main access to the outdoors. When they are not in use as private rooms, they are able to become extensions of the communal space that touch down to the internal park defined by the perimeter of similar buildings. They have fully openable windows on at least two sides with sills at the required railing height so can also be balcony-type spaces that allow as much or little connection to the outside as possible.

The units on the north and south ends of the building are the most effective extensions of the lounge/

dining area; this is because their long side meets the long side of that space. They also act as a balcony space when not in use as private rooms but are not an access due to their elevation.

The central four units on the eastern side act as the mediator between the three main living spaces on each storey. They have sliding partitions on two sides that can be fully removed, the middle two crossing the hallway to a cavity between the bathrooms. These rooms can be converted into a fully open, double height space, allowing the upper floor to feel as though it is suspended within an open space. They give the building a lot of spatial variety as they can transform the building from being six individual units across two storeys to two large units across two stories (figure 8.31) to one large unit (figure 8.35) and anything in-between those three.

<LEFT

Figure 8.25. Plan demonstrating how the buildings are divided into three individual units.

^ABOVE
Figure 8.26. Exploded
axonometric showing the division
of the building into three units

Division into three units

The design is in essence a large communal area that is two storeys high and can be divided into three individual units. There are twelve full bathrooms in total, in six locations, so each unit has the necessary amount on each storey. There are also six full kitchens, complete with under counter fridges and storage. This allows for a very dynamic occupation and means that groups of any size can occupy the place in as communal or private a manner as required. It is intended that there will be one permanent resident in the building that will organise the scheduling of the rooms and be responsible for the transforming of the spaces. This will require no more physical work than changing the sheets, tidying the room and

sliding the walls that are near frictionless. The room stacking units are operated by a mechanical system that has a powered electronic motor, activated by an integrated, computerised system to ensure the units are operated correctly. The ulterior motive for the person to live in the building is that it is to feel like a home and a permanent resident who is responsible for the operation will ensure that this effect is achieved. This will be done by organising to have as efficient use of the rooms as possible, utilising the communal spaces at least every day and not continuously filling the building to capacity as this is intended to be a temporary function of the building.

Organic Configuration

This is one of a possible 387,420,489 different permutations of the nine possible configurations across the nine units. It is more likely to appear somewhere between this and maximum occupancy (figure 8.33) based on how the operator chooses to run the building. This permutation involves a double height space that connects to two enlarged communal areas amongst various other room combinations.

It is a demonstration of the spatial variety that can be achieved not only across the building but over time. This was one of the intentions of utilising the picturesque effect, where the inhabitation and views are affected by the changing of the occupancy in a way that created unexpected moments. This variety is meant to appear random and unpredictable as does anything that occurs in nature, while articulating the subjects' views of both the building and the setting.

BELOW
Figure 8.27.

<LEFT
Figure 8.28. Ground level plan
showing configuration and where
section plane is located.

Level one plan for figure

RIGHT>
Figure 8.29. First level plan
showing configuration and where
section plane is located.

Level two plan for figure

<LEFT
Figure 8.30. First level plan
showing configuration and where
section plane is located.

^ABOVE.
Figure 8.31. Section perspective

Maximum floor area

This is what the building would look like if all partitions were opened and all rooms were folded away. It would serve as 557 m² of connected communal spaces and could house an endless amount of functions from large parties to workshops and community events.

<LEFT
Figure 8.32. First level plan
showing configuration and where
section plane is located.

^ABOVE
Figure 8.33. Section perspective

Maximum Occupancy

This is what the building would look like if the maximum 72 people were in residence. All rooms have a connection to the outside, and the lounge still has the large window that has the greatest view. There is no compromise of ventilation, natural light and other measurable aspects of health. The only compromise made is that it would feel crowded and is only likely to be viable during months when the town is at capacity. Lower rent price and more excitement would be enough to convince any tourist as they will still have access to the necessary sanitary and cooking facilities.

<LEFT
Figure 8.34. First level plan
showing configuration and where
section plane is located.

^ABOVE
Figure 8.35. Section perspective

Minimum Occupancy

This is what the building would look like with every unit and partition folded as far away as possible. The building would feel light and open, but not empty due to the articulation of the spaces in response to the hill shape.

Western stacking system

The stacking systems located on the west side of the building, as previously mentioned, offer the best physical connection to the outdoors. They have a double door at the rear and act as the main external access when the room is not being used privately. This is configurable as a double height space that allows the outdoors to permeate through the two levels simultaneously (figure 8.40), or as double balcony spaces, two private rooms (figure 8.39) or a combination (figure 8.38).

This is an example of how the building shares the amenities of the site as necessary; if it is a room, there is always a window, but the lounge is not deprived of windows as it has permanent windows on the eastern face. When one room is not in use, it is able to share both its space and its light and its view with the rest of the building.

This shifting relationship with the natural elements due to the flows of people in and out of the building adds to the picturesque of the building. It allows the programming of the building to significantly affect the environmental conditions of the space, creating a differing experience across the building and over time.

RIGHT>
Figure 8.36. First level plan showing configuration and where section plane is located.

<LEFT
Figure 8.37. All units folded away. two extended living spaces or outdoor spaces.

<LEFT
Figure 8.38. Bottom storey double room, top storey extended living space or outdoor space

<LEFT
Figure 8.39. Bottom and top stories both bunk rooms. Maximum occupancy.

OVERLEAF>
Figure 8.40. All stories folded away. Double height living extension of outdoor space. Options overlaid

<OVERLEAF

Figure 8.41. Completed building in context. Image shows parking and landscape integration.

Building and Site Integration

The notion of picturesque beauty resulted in the conclusion that unexplained natural variation contributes greatly to the picturesque of a scene. The building integrates with the hard and soft features of the site to both become more picturesque and to reduce its mass. The first way the site is integrated is by allowing the planar convex shape of the hill to push the middle unit out. The units then reconfigure their level in elevation by the relative height against the hill. This variation breaks up the mass and adds a naturally inspired complexity to the form. The living room is drawn out from the mass of the building as this deserves more visual preference than the private rooms.

This area where the building is recessed is mirrored by the landscaping in that mature trees are placed in front of the rooms to break up the visual mass of the building, making it a single entity with multiple appearances. This tactic was deduced from the picturesque whereby a smooth figure can have roughness applied to it to become more picturesque. The overall design moves described here adhere to the dualities described in all the writing surrounding the picturesque: advance and recess, simplicity and complexity, contrast and cohesion.

The building is also lifted up on the eastern front to allow for both parking and large tree root systems to permeate underneath. The parking (figure 8.42) is one per three rooms as described in the district plan. There is an access on the underneath of the building for both pedestrian and driver access. The

ABOVE
Figure 8.44. Plan demonstrating integration of nature and building

entire building is raised off the ground to reduce the impervious surface cover of the site by using the space for car parking and allowing large trees to grow roots under the building without detriment to the structure (figure 8.43).

BELOW

Figure 8.42. Section showing integration of parking to reduce impervious surface

BELOW
Figure 8.43. Section showing integration of landscape to allow for root systems underneath.

<LEFT

Figure 8.45. Occupation and articulation of view and kitchen.

BELOW

Figure 8.46. integration of building and view using landscape to break up mass by bridging form.

Exegesis

RIGHT>
Figure 9.01. Comparison of
current and proposed built forms

This thesis investigated how it is possible to densify suburban environments while making them more enjoyable places to be. The research begun by establishing that the regeneration and reintegration of native forest is a crucial aspect of creating a healthy and hence enjoyable environment. Two avenues were explored in regards to this relation and resulted in a set of criteria both objective and subjective to be satisfied by the design. This thought process was then applied to a large, developing site in Queenstown, in order to test the overall shift in density.

Process

With regards to the measurable, objective qualities devised by the discussion on density, this thesis succeeded by developing a masterplan, working on one unit and assuming a similar density for the rest of the development. Each iteration of the building achieves a greater efficiency than the last and the final design is a combination of the previous two, but achieves a greater density. When applied to the

12 hectare site as a typology, this achieves a total population of 2736 compared to the projected population of the current layout of 1118; this is a 2-4 times increase of the site population. This is however balanced by increasing the public open land tenfold and reducing the impervious surface cover by a factor of 6.

As it was established in the research, there are many more factors to success with regards to creating an enjoyable place than ratios of densities. The thesis began as an overly practical solution to a problem that required a level of poetic flare. The ‘Picturesque’ theory helped to transform this thesis by suggesting how aspects of nature could influence the design in a way that resulted from the re-appropriation of the theory.

The program of the design developed with each iteration of the building and is not limited to a hostel-type application. The reason for the variation in program throughout the iterations was to inform

RIGHT>
Figure 9.02. Current projected
occupancy of site in suburban
model

LEFT>
Figure 9.03. Proposed
inhabitation and density of site.

a result that satisfied both of the housing types of which Queenstown is so desperately in need.

a modulated system that could become a tiny stand-alone house or even as a transportable refuge for disaster relief.

Key findings

The picturesque provided the ability for the building to be a repetitious model yet appear as a series of individual units. The concept inspired much of the aesthetic and formal moves within the design, including the transforming of the spaces. Due to its wide variety of applications to do with the aesthetic of nature, there is much more that could be done to tie this concept together with that of Biophilia. Measures of density have their limitations and these need to be appreciated by developers. This thesis has pointed out the pitfalls of low and high density measures and suggests that a third and possibly a fourth factor be considered: public green space and volume, for example public open space / gross neighbourhood area.

Comments and Limitations

The research and design response could prove interesting to a wide variety of people as it uses a multidisciplinary approach to density and subjective happiness and health. It may be of interest to developers, urban planners and urban geographers as it offers discussion and response on the topic of density, and suggests an economical benefit to considering the integration of natural forest regeneration. It may be of interest to sustainability proponents as it provides a way to regenerate the natural forest in a setting that typically excludes extensive vegetation. The multidisciplinary approach did prove to be a limitation however, as it meant that some aspects could not be developed as desired. The master planning stage had to be reduced to only a test of density success in order to sharpen the focus of the development of the system, which was the main focus of the brief. The concept of behaviorology discussed by Atelier Bow Wow is also relevant to this topic but research had to be reduced and this concept was excluded. Further designs could investigate the more tactile connection of the human body to the system and develop the system in more detail. The articulation of the façade was excluded as it was another thesis's work to develop the weather-proofing necessary to make it practical. Finally, one suggestion from the reviews that was not investigated was that the initial module design could lend itself to

References

Ash, Megan. "Queenstown on the Move." *Architecture Now*. AGM Publishing, 26 Jan, 2016. Web. 04 Mar. 2016.

Burton, E., M. Jenks, and K. Williams. *The Compact City: A Sustainable Urban Form?* Taylor & Francis, 2003. Web.

Banash, David, and Anthony Enns. "Introduction: Suburbia." *Iowa Journal of Cultural Studies* 3.1 (2003): 1-7.

Chan, Kai M. A. et al. 'Conservation Planning for Ecosystem Services'. *PLoS Biology* 4.11 (2006): e379. CrossRef. Web

Clark, Zinnia. "Retrofitting suburbia: transforming car-dependent subdivisions into transit-and pedestrian-friendly neighbourhoods sounds like a miracle, and it is![Richmond, BC and Long Branch, Ontario]." *Alternatives Journal* 26.3 (2000): 19.

Corvalán, Carlos et al. *Ecosystems and Human Well-Being: Health Synthesis*. World Health Organization, 2005. Print

Costanza, Robert et al. 'The Value of the World's Ecosystem Services and Natural Capital'. *Ecological Economics* 25.1 (1998): 3-15. CrossRef. Web

Edens, John. "Slum-like Conditions, Anxiety, Emerging in Queenstown amid Housing Crisis." *Stuff NZ* 9 Sept. 2015. Print.

Fishman, Robert. "Introduction: Beyond Sprawl." *Sprawl and suburbia: a Harvard Design Magazine Reader*. Minneapolis: University of Minnesota Press. 2005. xi-xviii. Print.

Forsyth, Ann. "Measuring density: working definitions for residential density and building intensity." *Design Brief* 9 (2003).

Gilpin, W. *Three Essays: On Picturesque Beauty*, 1792. Web.

Hathaway, Mark. "Queenstown's Housing Squeeze: 30 under One Roof." *One News* 28 May 1025 Web.

Jamieson, Debbie. "Queenstown Proposals for Government's Special Housing Areas Revealed." *Otago Daily Times* 30 Apr. 2015. Print.

Kellert, Stephen R., and Edward O. Wilson. *The biophilia hypothesis*. Island Press, 1995.

Luttik, J. (2000). *The value of trees, water and open space as reflected by house prices in the Netherlands*. *Landscape and Urban Planning*, 48(3-4), 161-167

Macarthur, John. "The Picturesque Movement-Effect: Motion and Architectural Affects in Wölfflin and Benjamin." *Australian and New Zealand Journal of Art* 3.1 (2002): 136-157. CrossRef. Web.

Macarthur, J. *The Picturesque: Architecture, Disgust and Other Irregularities*. Taylor & Francis, 2013. Web. *The Classical Tradition in Architecture*.

Maher, Sasha, and Jacqueline McIntosh. "Density and identity: the place of sharing and privacy in sustainable housing." *SB07 Conference*. 2007.

Morrison, Philip S. 'Local Expressions of Subjective Well-Being: The New Zealand Experience'. *Regional Studies* 45.8 (2011): 1039-1058. CrossRef. Web.

Norberg, Jon. 'Linking Nature's Services to Ecosystems: Some General Ecological Concepts'. *Ecological Economics* 29.2 (1999): 183-202. CrossRef. Web

Nunns, Peter. 'Briefing Papers 9: Housing and Transport: Proximity Matters'. *transportblog.co.nz*. N.p., n.d. Web. 8 Oct. 2015.

Otago Regional Council. *Pressures and Risks Facing Land Transport in Otago*. N.p., 2011. Print.

Pairman, David et al. *Impervious Surface Mapping for the Auckland Region*. [Auckland, N.Z.]: Auckland Regional Council, 2010. Open WorldCat. Web. 11 Oct. 2015.

Pedersen Zari, Maibritt. 'Ecosystem Services Analysis for the Design of Regenerative Built Environments'. *Building Research & Information* 40.1 (2012): 54–64. CrossRef. Web

Penn, Dustin J., and Iver Myserud. *Evolutionary Perspectives on Environmental Problems*. Transaction Publishers. 2007. Print

Pevsner, Nikolaus, and Mathew Aitchison. *Visual Planning and the Picturesque*. Los Angeles: Getty Research Institute, 2010. Print.

Reynolds, J., and J. Burnet. *The Discourses of Sir Joshua Reynolds*. J. Carpenter, 1842. Web.

Stähle, Alexander. 'More Green Space in a Denser City: Critical Relations between User Experience and Urban Form'. *Urban Design International* 15.1 (2010): 47–67. CrossRef. Web.

Statistics NZ. "QuickStats About Queenstown-Lakes District." *Statistics New Zealand, Statistics NZ*, 2006. Web. 4 Mar. 2006.

Ulrich, R. S. "View through a Window May Influence Recovery from Surgery." *Science (New York, N.Y.)* 224.4647 (1984): 420–421. Print.

Van Uden, Vanessa. *Economic Futures Taskforce Report*. Shaping Our Future Steering Group, 2012. Print.

Wallace, Ken J. 'Classification of Ecosystem Services: Problems and Solutions'. *Biological Conservation* 139.3-4 (2007): 235–246. CrossRef. Web

Wilson, Edward O. *Biophilia*. Harvard University Press, 1984.

Wölfflin, Heinrich, and Mary Hottinger. *Principles of Art History: The Problem of the Development of Style in Later Art*. New York: Dover, 1950. Print.

Figures

Figure 1.01. Author's own image, taken from site in Queenstown.

Figure 1.02. Harbor Freeway, 2006. <https://commons.wikimedia.org/wiki/File%3AHarbor_Freeway.jpg>

Figure 2.01. Author's image of development in Queenstown. 2015

Figure 2.02. Strong model of Sustainability. Authors image. 2015.

Figure 2.03. Hagley park, Christchurch, Geoff Wilson, 2012. <https://en.wikipedia.org/wiki/List_of_tallest_buildings_in_Christchurch#/media/File:Hagley_Park_01.jpg>.

Figure 2.04. Information Compiled from Morrison and Auckland Regional Council study of impervious surface coverage.

Figure 2.05. High-Density Family Housing. Toby Shephard and Tim Matthews. < http://www.aucklanddesignmanual.co.nz/resources/articles/high_density_family_housing>.

Figure 3.01. Author's own Image. Taken from Queenstown Hill. 2015

Figure 3.02. Estate Bungalow at Mathugama. <<http://architizer.com/firms/archt-narein-perera/>>.

Figure 3.03. Estate Bungalow at Mathugama <<http://architizer.com/projects/estate-bungalow-at-mathugama/>>.

Figure 3.04. Section produced by author. 2015

Figure 3.05. Hiroshi Senju Museum / Ryue Nishizawa. Archdaily. <<http://www.archdaily.com/201238/hiroshi-senju-museum-ryue-nishizawa>>

Figure 3.06. Indicative plan produced by author. 2015.

Figure 3.07. Section produced by author. 2015

Figure 3.08. Aerial imagery compiled by author. Google maps.

Figure 3.10-3.13 Image of the Institute for Forestry and Nature Research. < <http://behnisch.com/projects/22>>.

Figure 3.09. Author's own image. 2015

Figure 4.01. Author's own image. Queenstown. 2015

Figure 4.02. Section of 'The Deluge' (1508-12) Painting by Michelangelo di Lodovico Buonarroto Simoni.

Figure 4.03. 'Pythagoras Advocating Vegetarianism' (1618-20) Painting by Peter Paul Rubens

Figure 4.04. Aerial image of Wimpole Estate. 2015. Google images.

Figure 4.05. Wimple in the County of Cambridge the Seat of the Rt. Hon. Charles Bodville. Leonard Knyff and Johannes Kip. (1707). < <http://www.gac.culture.gov.uk/work.aspx?obj=10817>>.

Figure 4.06. Aerial image of Wimpole Estate's South garden avenue. <source deleted>

Figure 4.07. Author's own image. Aerial imagery overlaid with 1739 landscaping plan for North Garden.

Figure 4.08. Author's own image. Aerial imagery overlaid with Capability Brown's 1760 plan for North Garden.

Figure 4.09. Authors own image. Aerial imagery overlaid with Emes 1790 plan for South Garden

Figure 4.10. Wimpole Estate folly. <<https://ruththerunner.wordpress.com/tag/tim-noakes/>>

Figure 4.11. Survey-produced image of Wimpole Estate folley form. < <http://www.mksurveys.com/about/case-studies/wimpole-s-folly>>.

Figure 4.12. Author's own image. 2015.

Figure 4.13. Highclere Castle Estate's folley Viewed from the tower. <<http://www.highclerecastle.co.uk/planning-your-visit>>.

Figure 4.14. Highclere Castle viewed from behind folley. < <http://www.britainsfinest.co.uk/gardens/gardens.cfm/searchazref/81001190HIGA>>.

Figure 5.01. Author's own image taken from Queenstown Hill. 2015.

Figure 5.02. Location of Queenstown. Authors own image. 2015.

Figure 5.03. Expansion of Queenstowns satellite towns. Authors own imge. 2015.

Figure 5.04. Bus routes Queenstown. Authors own image. 2015.

Figure 5.05. Bus routes connecting Queenstown and ski fields, site shown in red. Authors own image. 2015.

Figure 5.06 - 12. Road networks Queenstown. Authors own image. 2015.

Figure 5.13. Development of road networks over time.

Figure 5.14. Mass of built environment Queenstown (red) within the Queenstown Urban Area. Authors own image. 2015.

Figure 5.15. Population distribution Queenstown. Authors own image. 2015.

Figure 5.16. Distance from site to town centres, Queenstown. Authors own image. 2015.

Figure 5.17. Distribution of vatiuous accommodation types within Queenstown. Authors own image. 2015.

Figure 5.18. Possible links from forest to lake. Authors own image. 2015.

Figure 5.19. Extension of walk to public transport . Authors own image. 2015.

Figure 5.20. Demonstration of existing houses on site. Authors own image. 2015.

Figure 5.21. Location of site within urban form of Queenstown Authors own image. 2015.

Figure 6.01.

Figure 6.02. Inhabitation of the Suitcase House. <<http://usunlife.egloos.com/m/10089442>>.

Figure 6.04. Diagram of openings in the floor of Suitcase House. <<https://s-media-cache-a.k0.pinimg.com/originals/55/ca/e0/55cae0b3c796edb96190fd839c18ee55.jpg>>

Figure 6.03. Design team and inhabitation of the Suitcase house < <http://gizmodo.com/a-hotel-full-of-secret-rooms-invites-an-epic-game-of-hi-718156776>>.

Figure 6.05. Plans of varoius configurations of the Suitcase House. < <http://www.designboom.com/architecture/suitcase-house-by-gary-chang-hides-program-beneath-ground/>>.

Figure 6.06. Inhabitation of the Naked House. <http://www.shigerubanarchitects.com/works/2000_naked-house/>

Figure 6.07. Plan of the Naked House. Authors own image. 2015.

Figure 6.08. Inside the Naked house. <http://www.shigerubanarchitects.com/works/2000_naked-house/>.

Figure 6.09. Gary Chang's Hong Kong Apartment. <http://www.shigerubanarchitects.com/works/2000_naked-house/>

Figure 6.10. Plan of the Gary Chang's apartment indicating movement. Authors own image. 2015.

Figure 6.11. Library stack systems rolled out.

Figure 6.12. Library stack systems in Casa De Yolanda occupied by visitors

Figure 6.14. Library stack systems opening for visitors in Life Edited Apartment. <<http://architizer.com/blog/life-edited-interview/>>.

Figure 6.13. Casa De Yolanda under normal occupation. <<http://www.catalogodiseno.com/2014/11/11/pkmn-arquitectura-pacman/>>

Figure 6.15. 'Life Edited' apartment ready for maximum occupancy. <<http://architizer.com/blog/life-edited-interview/>>.

Figure 6.16. Casa MJE rotating walls in operation. <<http://afasiaarchzine.com/2015/09/pkmn-2/pkmn-casa-mje-madrid-1/>>

Figure 6.18. Plan produced of Casa MJE. <<http://afasiaarchzine.com/2015/09/pkmn-2/pkmn-casa-mje-madrid-1/>>

Figure 6.17. Casa MJE rotating walls in operation <<http://afasiaarchzine.com/2015/09/pkmn-2/pkmn-casa-mje-madrid-1/>>

All Following Images are author's own unless stated otherwise.

Figure 7.01. Author's first week sketches.

Figure 7.02. Process diagram for developing system

Figure 7.03. Overall form of apartment.

Figure 7.04. Plan of initial apartment design in normal use

Figure 7.05. Frames of animation of initial apartment design.

Figure 7.06. Site plan of buildings within overall site

Figure 7.07. Site plan. Blues building investigated in this iteration.

Figure 7.08. Axonometric of first original system of movement.

Figure 7.09. Sections and plans of different possible configurations of units.

Figure 7.10. Site plan of new building design (detailed).

Figure 7.11. Impression of second original system design.

Figure 7.12. Ground level plan

Figure 7.14. interior of space created when units folded away

Figure 7.13. First level plan

Figure 7.15. Impression of second original system design.

Figure 7.17. Sequence of moving model of one room unit that collapses down into itself.

Figure 7.19. Junction at each corner of unit, worm-drive system moves unit up and down.

Figure 7.16. All units folded away. Double height space beneath.

Figure 7.18. All units folded out. Maximum occupancy

Figure 7.20. Bottom units folded out. Floating lounge on second storey.

Figure 7.21. Front units folded out. Separate lounge at rear.

Figure 7.22. Top units folded out. Open floor beneath.

Figure 7.23. Design of how room contents can move independently of walls

Figure 7.24. Plan ground level.

Figure 7.25. Plan first level.

Figure 7.26. Plan second level

Figure 7.27. Complete system in site (closed)

Figure 7.28. Complete system in site (open)

Figure 7.29. Internal use of building (winter)

Figure 7.30. Fluid use of building (summer).

Figure 8.01. Taste of the final Design in context

Figure 8.02. Location of building on site

Figure 8.03. Ground level plan.

Figure 8.04. Second level plan

Figure 8.05. Proprietary generic Worm-drive system in H-configuration

Figure 8.06. Proprietary generic Worm-drive system driver.

Figure 8.07. Exploded axonimetric of design for movement system integrating proprietary system.

Figure 8.08. Corner detail of how proprietary system meets column at one of four corners of each unit.

Figure 8.09. Plan and elevations of system showing placement of parts within units.

Figure 8.13. Plan of bunk unit design, dotted lines represent folded down position

Figure 8.14. Axonometric of unit design

Figure 8.10. Unit fully folded out

Figure 8.11. Unit half unfolded

Figure 8.12. Unit fully folded down

Figure 8.15. Unit fully folded out

Figure 8.16. Unit half unfolded

Figure 8.17. Unit fully folded down

Figure 8.18. Plan of double unit design, dotted lines represent folded down position

Figure 8.19. Axonometric of unit design

Figure 8.20. Different configurations of units.

Figure 8.21. Exploded axonometric showing structure and fixed floor layout.

Figure 8.22. Section perspective showing the action of sliding walls that public and private.

Figure 8.23. Key plan showing where sectional perspective is located.

Figure 8.24. Plan demonstrating where moving units are located within building. Shown in red.

Figure 8.25. X-ray axonometric showing locaiton of movement within building.

Figure 8.26. Plan demonstrating how the buildings are dividede into three individual units.

Figure 8.27. Exploded axonometric showing the division of the building into three units

Figure 8.28. Section perspective

Figure 8.29. Ground level plan showing configuration and where section plane is located.

Figure 8.30. First level plan showing configuration and where section plane is located.

Figure 8.31. First level plan showing configuration and where section plane is located.

Figure 8.32. Section perspective

Figure 8.33. First level plan showing configuration and where section plane is located.

Figure 8.34. Section perspective

Figure 8.35. First level plan showing configuration and where section plane is located.

Figure 8.36. Section perspective

Figure 8.37. First level plan showing configuration and where section plane is located.

Figure 8.38. All units folded away. Two extended living spaces or outdoor spaces.

Figure 8.39. Bottom storey doble room, top storey extended living space or outdoor space

Figure 8.40. Bottom and top stories both bunk rooms. Maximum occupancy.

Figure 8.41. All stories folded away. Double height

living extension of outdoor space. Options overlaid

Figure 8.42. Completed building in context. Image shows parking and landscape inregration.

Figure 8.43. Section showing integration of parking to reduce impervious surface

Figure 8.45. Plan demonstrating integration of nature and building.

Figure 8.44. Section showing integration of landscape to allow for root systems underneath.

Figure 8.46. Occupation and articulation of view and kitchen.

Figure 8.47. Integration of building and view uning landscape to break up mass by bridging form.

Figure 9.01. Comparison of current and proposed built forms

Figure 9.02. Current projected occupancy of site in suburban model

Figure 9.03. Proposed inhabitation and density of site.

fin.