

TECTONICS & MATERIAL
IN THE DESIGN OF A MEDITATION CENTRE
IN PEGGY'S COVE, NOVA SCOTIA

by

Zhe Wang

Submitted in partial fulfilment of the requirements
for the degree of Master of Architecture

at

Dalhousie University
Halifax, Nova Scotia
March 2011

DALHOUSIE UNIVERSITY
SCHOOL OF ARCHITECTURE

The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "TECTONICS & MATERIAL IN THE DESIGN OF A MEDITATION CENTRE IN PEGGY'S COVE, NOVA SCOTIA" by Zhe Wang in partial fulfilment of the requirements for the degree of Master of Architecture.

Dated: March 22, 2011

Supervisor: _____

Advisor: _____

External Examiner: _____

DALHOUSIE UNIVERSITY

Date: March 22, 2011

AUTHOR: Zhe Wang

TITLE: TECTONICS & MATERIAL IN THE DESIGN OF A MEDITATION CENTRE IN
PEGGY'S COVE, NOVA SCOTIA

DEPARTMENT OR SCHOOL: School of Architecture

DEGREE: MArch

CONVOCATION: May

YEAR: 2011

Permission is herewith granted to Dalhousie University to circulate and to have copied for non-commercial purposes, at its discretion, the above title upon the request of individuals or institutions. I understand that my thesis will be electronically available to the public.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

The author attests that permission has been obtained for the use of any copyrighted material appearing in the thesis (other than brief excerpts requiring only proper acknowledgment in scholarly writing), and that all such use is clearly acknowledged.

Signature of Author

CONTENTS

ABSTRACT.....	vi
ACKNOWLEDGEMENTS	vii
Chapter 1: Introduction	1
Thesis Question	1
Meditation Theory	2
Cultural Context: Why Choose Peggy’s Cove?	3
Site Description.....	5
Program Description	6
Chapter 2: Pre-Design	7
Site Conditions.....	7
Bedrock.....	7
Wind.....	9
Watershed and Wetland	10
Finding a Building Site	12
Chapter 3: Design	14
Intention	14
Mind-Body Awareness	14
Material Tectonic Awareness.....	15
Negative Space.....	15
Buoyancy: A Structural Effect of Architectural Form.....	16

Tectonic Study	16
Charcoal Facade Study	18
Chapter 4: Final Design	20
Path and Inhabitation	20
Form, Material and Structure	27
Floating Rocks	27
Gathering Hall	29
Wooden "Net"	32
Final models and drawings	33
Detail Connection.....	43
Chapter 5: Conclusion	46
Response to Original Thesis Question	46
Potential Direction for Further Study.....	47
Appendix	48
Geology Study	48
Bedrock Classification.....	50
Rock Excavation	51
Charcoal Filter Wall Making.....	52
Parametric Design Summary	54
Relationship between parametric design and the meditation centre design for my thesis	56
References	57

ABSTRACT

Meditation means awareness. It is a process inducing a series of steps, that leads to a state of consciousness which brings serenity and clarity. While the space we choose for meditating needs to reflect the state of clear mind, if possible, it should be isolated from the noisy city and in a natural pure land.

This thesis investigates meditation theory and the natural context of Peggy's Cove, as well as material and tectonic experiments, to design a New Meditation Centre in Peggy's Cove, Nova Scotia. The design of the New Meditation Center proposes building as a new form of architecture, the form, material and construction of which engages the viewer to admire and respect our nature.

ACKNOWLEDGEMENTS

The development of this thesis is not without much invaluable contribution from my supervisor, Christine Macy, and advisor, Richard Kroeker, whose instruction and direction have strengthened the idea and the content.

I would like to acknowledge the great help I received from all the faculty members and my classmates during my four years of study at the Architecture School of Dalhousie University.

I would also like to thank all of my friends for their help and support.

Last but not certainly not least, thanks Mom, Dad and Bingjie for being so incredibly supportive for as long as I can remember. I couldn't have done it without you.

CHAPTER 1: INTRODUCTION

Though most people in the world would choose to live in peace and joy if they could, reality rarely seems to allow it. Quite conversely, many of us experience life as a lost opportunity—a suffering. Nonetheless, my own life has taught me that paradise is not as far away as we think... it can be uncovered within the heart and the mind, for it exists about each and every person at all times, with or without their knowledge...(Canada Bodhi Dharma Society 2007, para. 2)

In a modern world that values activities, achievements and results, it is perhaps surprising that more people are turning to meditation. Despite all the activity of modern society, many still feel a fundamental need for silence, inner peace, and moments of reflection. According to Buddhist tradition, the human mind has the ability to heal, rebalancing physical and mental illness and encouraging a broader perspective. Jin Bodhi, founder of the Canada Bodhi Dharma Society, firmly believes that by changing perception and behavior, each person can create a Pure Land for themselves here and now.



View towards the Atlantic Ocean. Peggy's Cove, Nova Scotia.

THESIS QUESTION

How can a New Meditation Centre be designed at the Peggy's Cove area in terms of material and tectonic awareness?

MEDITATION THEORY

...According to the Buddhist tradition, we don't get new wisdom, nor does any foreign element come into our state of mind at all. Rather, it is a question of waking up and shedding our covers. We have those goodies in us already; we only have to uncover them (Trungpa 1991, 5)

The word meditation is derived from two Latin words: meditari (to think, to dwell upon, and to exercise the mind) and mederi (to heal). Its Sanskrit derivation 'medha' means wisdom (Meditation 2006, para. 5). An ordinary person may think meditation is a way of worship, but that is not true. The meaning of meditation is not to concentrate your mind on something, but rather "to see things as they are, to observe things as they are, and let everything go as it goes" (Discoe & Quinn 2008, 17). In a word, meditation means awareness. Whatever you do with awareness is meditation. Listening to the waves is meditation; walking with heart is meditation; watching your breath is meditation. As long as these activities are free from any other mental distractions, they are meditation.



Walking monk by L. Michael Roberts. From flickr.com



Kid meditate for 15 min every morning in class, Burma, Myanmar, photography by Edson Walker. From .flickr.com

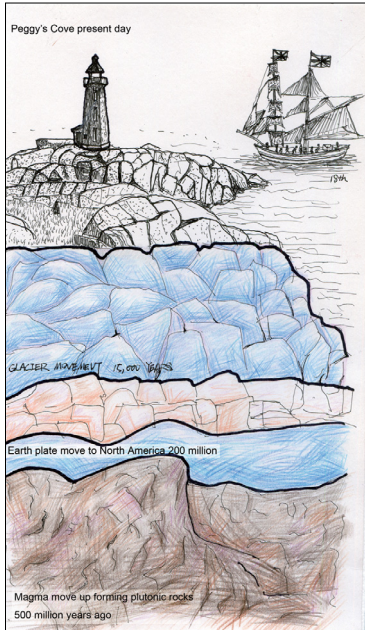
CULTURAL CONTEXT: WHY CHOOSE PEGGY'S COVE

Thunder, to the Buddhist mind, is good news. A cracking, booming sky is a heavenly dragon proclaiming powerful, irrefutable truth. The symbolism goes further: every time someone experiences a flash of waking up to reality, it's accompanied by a thunderclap of awareness. Ocean, for Nova Scotians, means much more than sustenance and transportation. It provides definition. No Nova Scotian lives more than fifty miles from the sea, and the great majority hug the coast (Swick 1996, 2).

Peggy's Cove is located 53km southeast of Halifax along the southern shore of Nova Scotia. It lies on the eastern side of the mouth of St. Margarets Bay in Halifax County. From the earliest days to the present, it has been an amazing place in the world, not only because its beauty attracts thousands of visitors each year, but also because of its dramatic history. The Mi'kmaq people were the first to reside here, spending their summers, harvesting the riches of the sea. European settlers landed here in the 18th century, drawn by the rich fishing grounds. In the 1980s, the fishery was exhausted, and in 1998, Swissair Flight 111 crashed off the shore of Peggy's Cove, and some families of the victims have since been welcomed to work and live in the community.



Peggy's Cove lighthouse, Halifax, Nova Scotia photo by David. From flickr.com



Drawing of the Peggy's Cove rock formation



Rocks in Peggy's Cove, Halifax, Nova Scotia.



Zen Rock Garden, photo by Jen Gallardo. From flickr.com

I chose Peggy's Cove as a site for this thesis because its natural rocks (which play a primal role in meditation) are dramatic in this area. Their formation was the result of plate tectonics; movement of the Earth's crust that allowed magma to bubble up from the Earth's interior, forming plutonic rocks about 500 million years ago.

Through chemical and physical reaction in the nature, the heat and pressure of the events by the earth tectonic moment soften rocks into harder rocks like quartzite and granite (Choyce 2008, 13).

The unique landscape of Peggy's Cove and its surrounding areas was then carved by the migration of glaciers during the last ice age, about fifteen thousand years ago. The granite rocks, weathered and cracked by time and the elements recorded the natural energy transformation. According to Chinese and Japanese beliefs, rocks are animate in the sense that they partake the mind-nature of all sentient beings.

SITE DESCRIPTION

The site for the Meditation Centre is located on the far side of a drumlin which spans 1,400 metres from northwest to southeast and 690 metres from northeast to southwest. This site is about 1.5 km north of Peggy's Cove lighthouse. Due to its natural bedrock, minerals and landform the site is a nature preserve protected by the government of Nova Scotia. In order to create a building, the environment needs to be studied, so the question arises: how can the man-made building fit into the nature?

From the geologist's point view: nature can be considered as interacting process, responsive to laws, constituting a value system, offering intrinsic opportunities and limitations to human uses" (McHarg 1992, 55).

In the design part of the thesis, the site is investigated in detail to set up the location for the Meditation Centre.



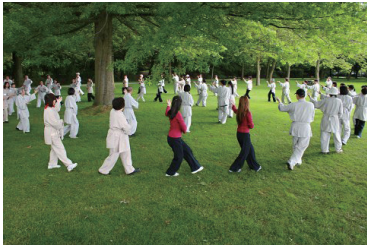
Peggy's Cove area. From Google Map. Scale 1: 8000

PROGRAM DESCRIPTION



Meditation Level 1. From Heartwood, Yoga Meditation.

To use the Meditation Centre as a metaphor, the way of approaching the space in the building can be considered as meditation or mind awareness. Ideally this meditation centre is designed for 10 to 50 persons. The size of each space is controlled. The program includes meditation halls, public space, offices, and residences. There are three meditation halls for different meditation levels:



Meditation Level 2. From Canada Bodhi Society

On the first level, for people who need silence, inner peace, and a moment of reflection, meditation could help their physical health and relaxation. The level one meditation class would serve 10 to 20 persons.

On the second level, for people seeking better health, meditation could help healing by rebalancing physical and mental illness and encouraging a broader perspective. The level two meditation class would serve 10 to 15 persons.



Meditation level 3. From Liangzi's Blog

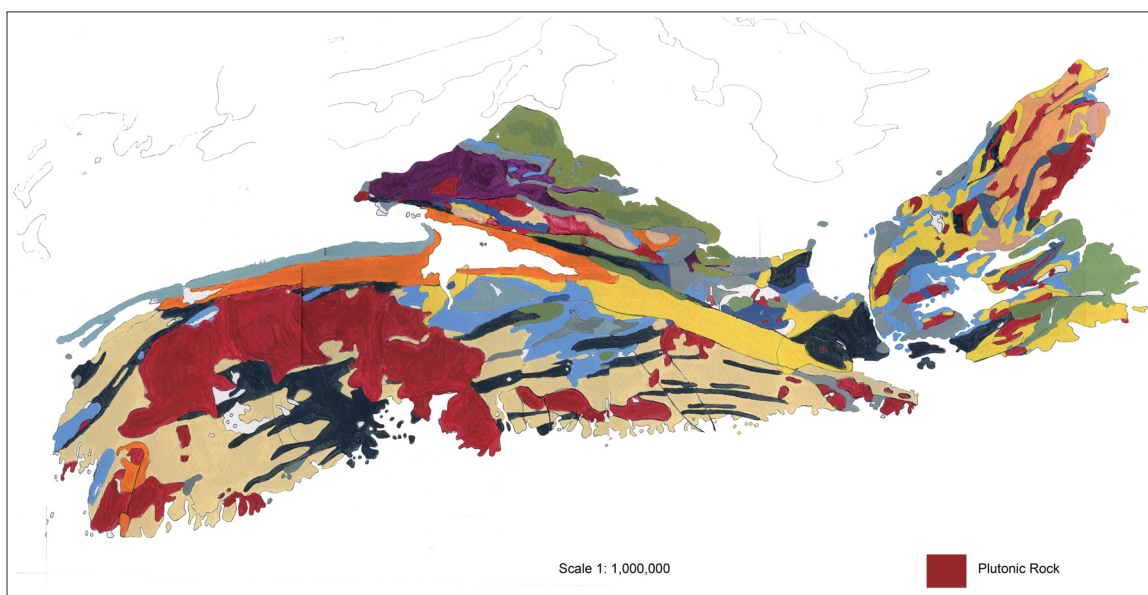
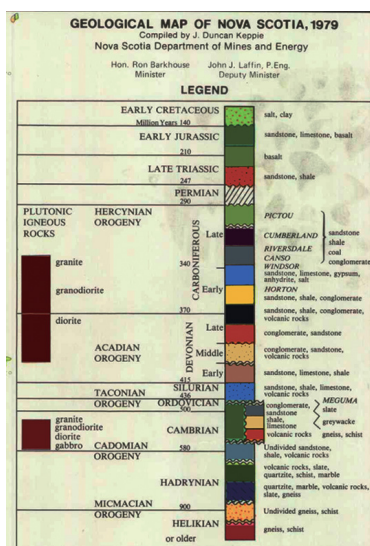
On the third level, for people who are motivated by compassion and seek a fully awakened mind not only for themselves but also for others, deep meditation will be practiced individually in a secluded place. In this case, each individual meditator needs a single small space resembling a cave.

CHAPTER 2: PRE-DESIGN

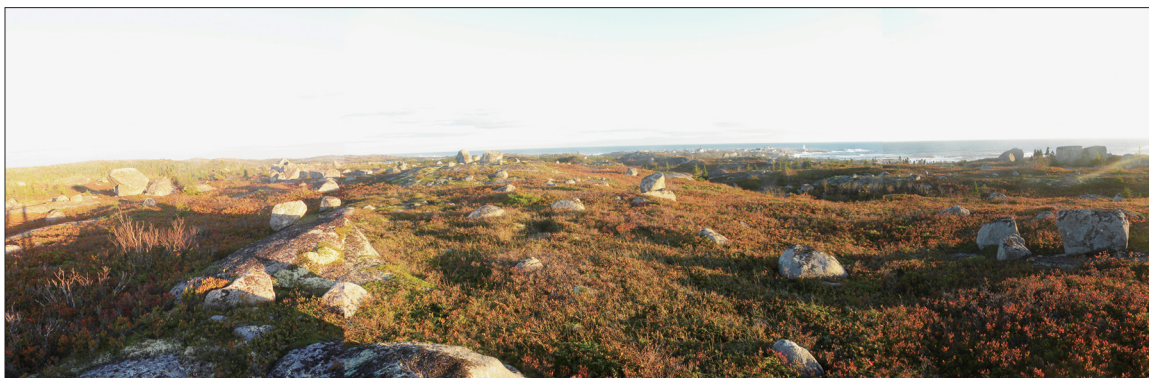
SITE CONDITIONS

BEDROCK

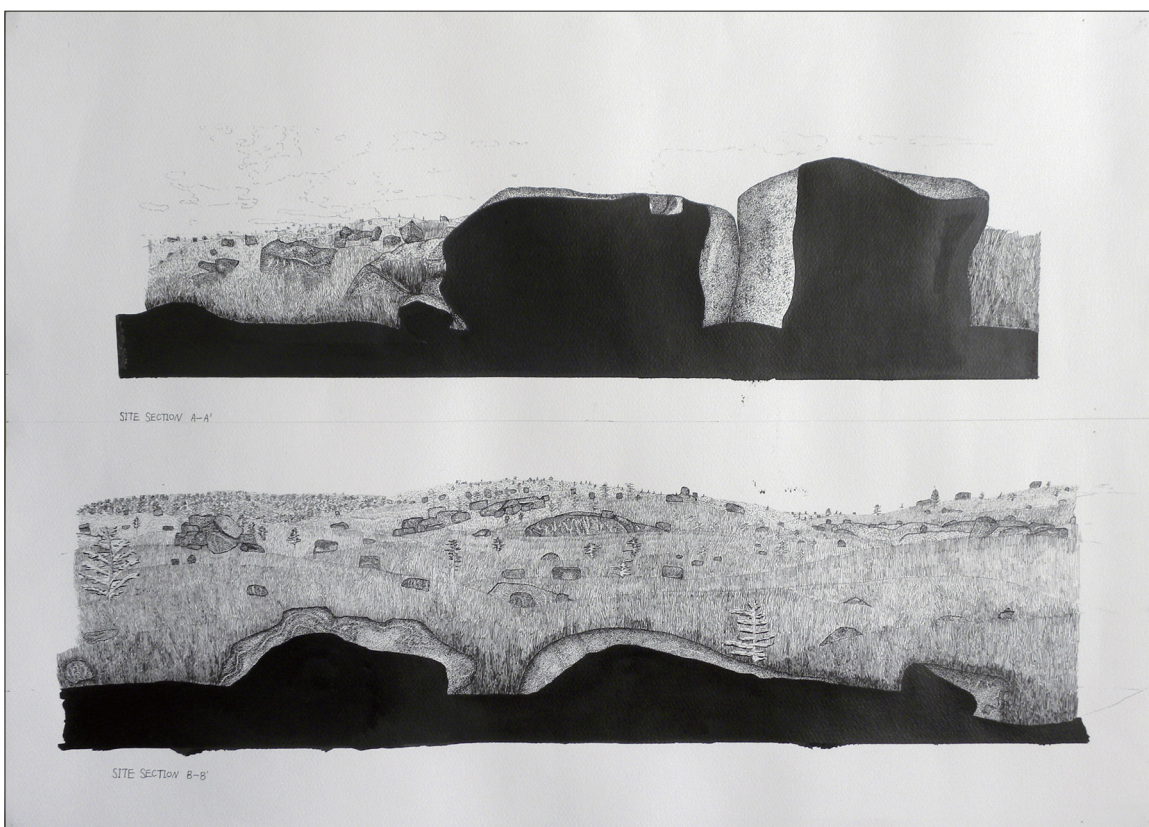
During the last ice age, just the day before yesterday in geological time, the landscape of Nova Scotia was shaped by glacier movement. The advancing glacier ploughed the land flat, down to the sedimentary, shale bedrock, while picking up and transporting stones and soil. The retreating glacier deposited the debris from hundreds of miles away in long piles on the northwest axis of the retreat, perpendicular to Nova Scotia's coast (Lyons 2008, 35). Rocks at the base of moving glaciers left scratches called glacial striations on the bedrock surface. The glaciers also deposited a mixture of unsorted rocks, gravel, sand and clay known as glacial till. This formed hill-like drumlins such as Citadel Hill. There is also a series of drumlins in Peggy's Cove. To geologists, rocks are both time capsules and history books.



Painting of geology map of Nova Scotia. Formation and division of different bedrocks in Nova Scotia.



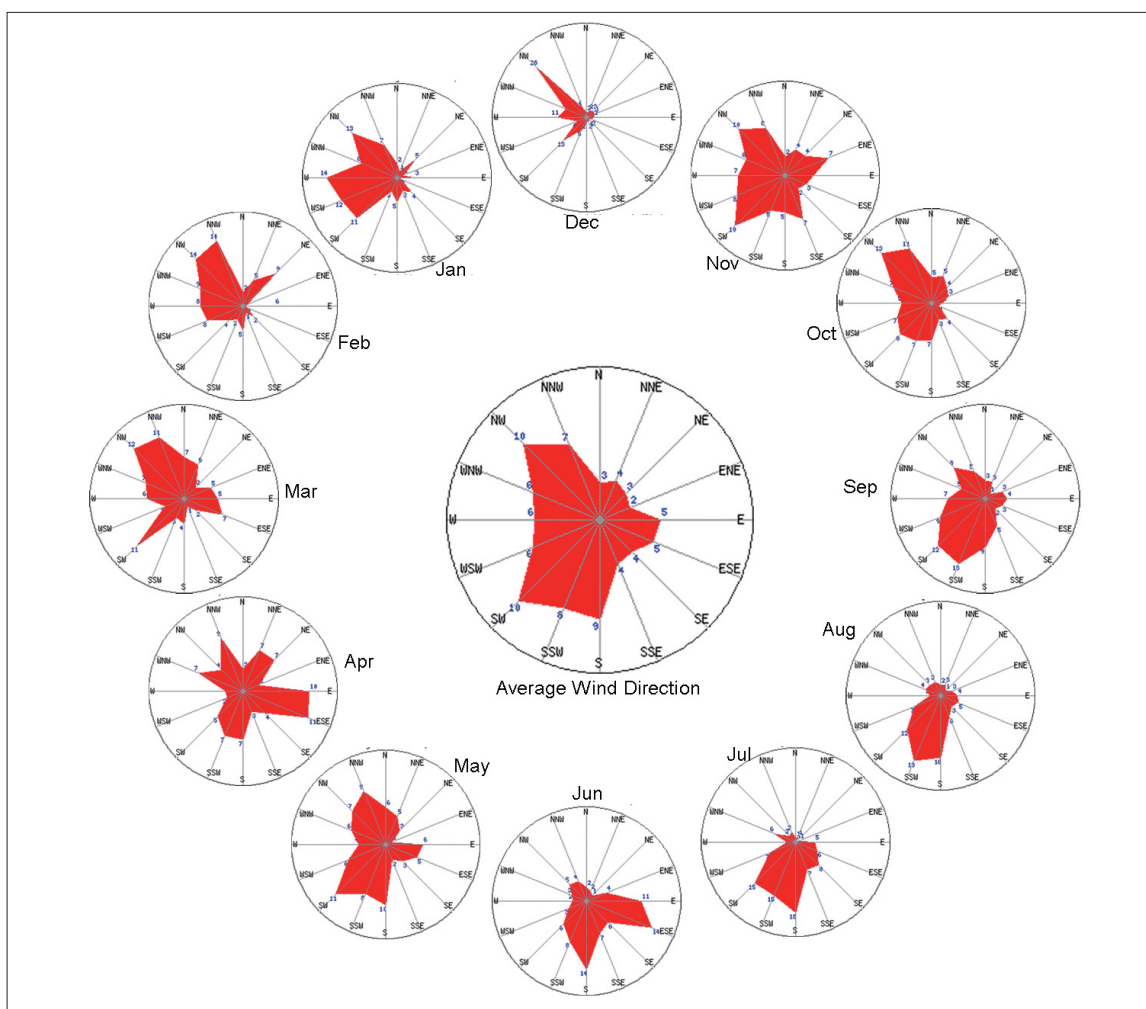
View of the rocks in the drumlin of Peggy's Cove, Nova Scotia.



Section drawing of the land in the drumlin of Peggy's Cove, Nova Scotia.

WIND

The wind speed of Halifax is strong. According to Environmental Canada, the maximum average wind speed in Halifax since 2009 is about 22 mph. In winter (November, December and January), high winds come mainly from the north and northwest, while in summer (June, July and August), they are from south and southwest. For the site selection, exposed locations will be avoided since winds are strongest at higher elevations.

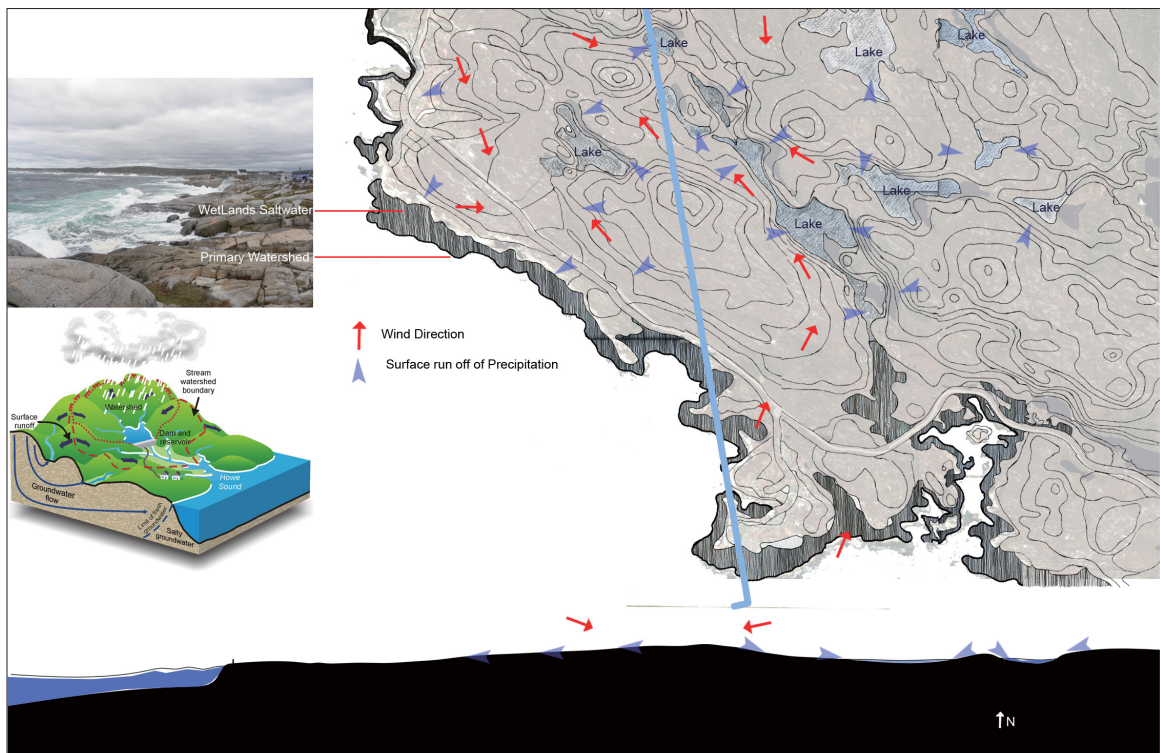


Wind Study. Picture from Environmental Canada.

WATERSHED AND WETLAND

A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. Wetlands are essential ecological features in any landscape. They are primary habitat for hundreds of species of waterfowl as well as many other birds, fish, mammals and insects. Therefore, for a sustainable design, both watersheds and wetlands of the Peggy's Cove area must be protected.

In terms of design, the building should be located in a place close to lakes or ponds since the ground of this area is bedrock with few soils. The water in rivers and streams can be used as groundwater (McHarg 1992, 56).



*Watershed Study: Map and Section
Scale 1:7,000.*

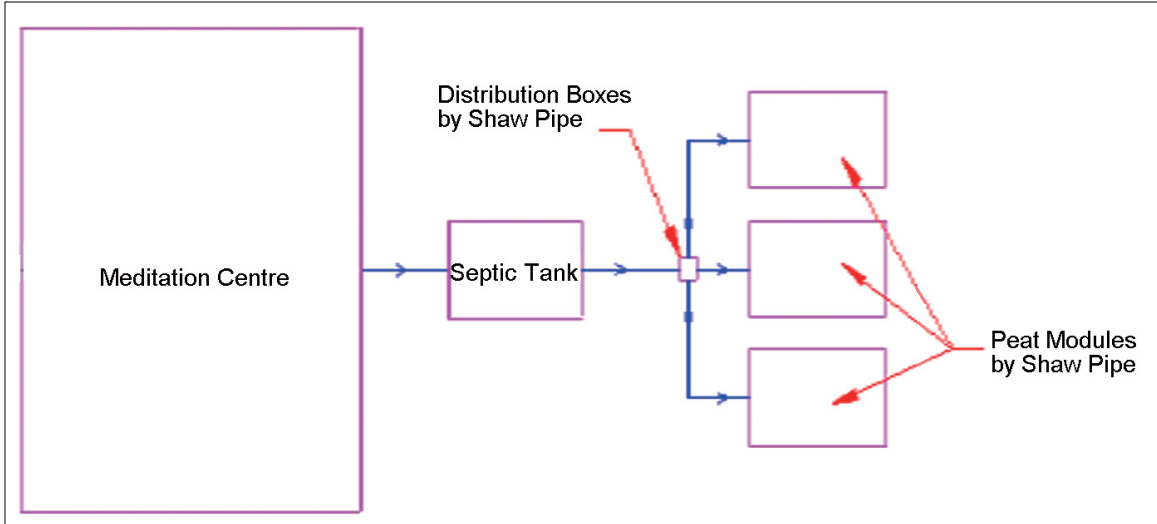
To protect the wetlands, a self-contained peat system can provide an economic and conventional solution on the bedrocks. Basically it has three procedures: physical filtration, absorption and microbial action. In the physical filtration process, the solids and organisms from the wastewater are retained by the peat moss; the remaining negatively charged particles in the wastewater effluent are absorbed by the peat whose particles are positively charged; in the microbial activity, the fungi are growing in the acidic environment to assimilate nitrogen in the septic tank effluent (Shaw Company 2006, para. 2).

The Shaw Peat Treatment System consists of several components: precast concrete tanks are provided as both the septic tanks and distribution boxes. The effluent flows from the septic tank into a series of parallel flows which are piped to treatment modules:

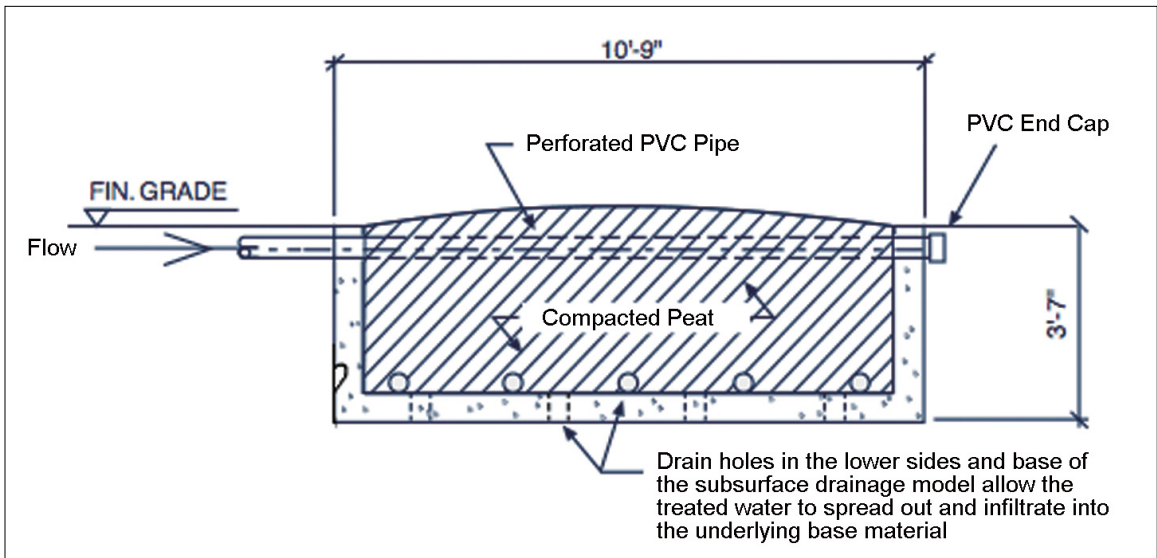
The modules are fabricated from open top concrete tanks that are filled with compacted peat. A system of perforated PVC piping near the top of the module disperses the wastewater flow over the peat. Once the wastewater reaches the bottom of the module it is released directly into the soils through holes in the bottom and sides of the concrete tank (Hawley 2003, para. 8).



Shaw Peat. From Shaw Company



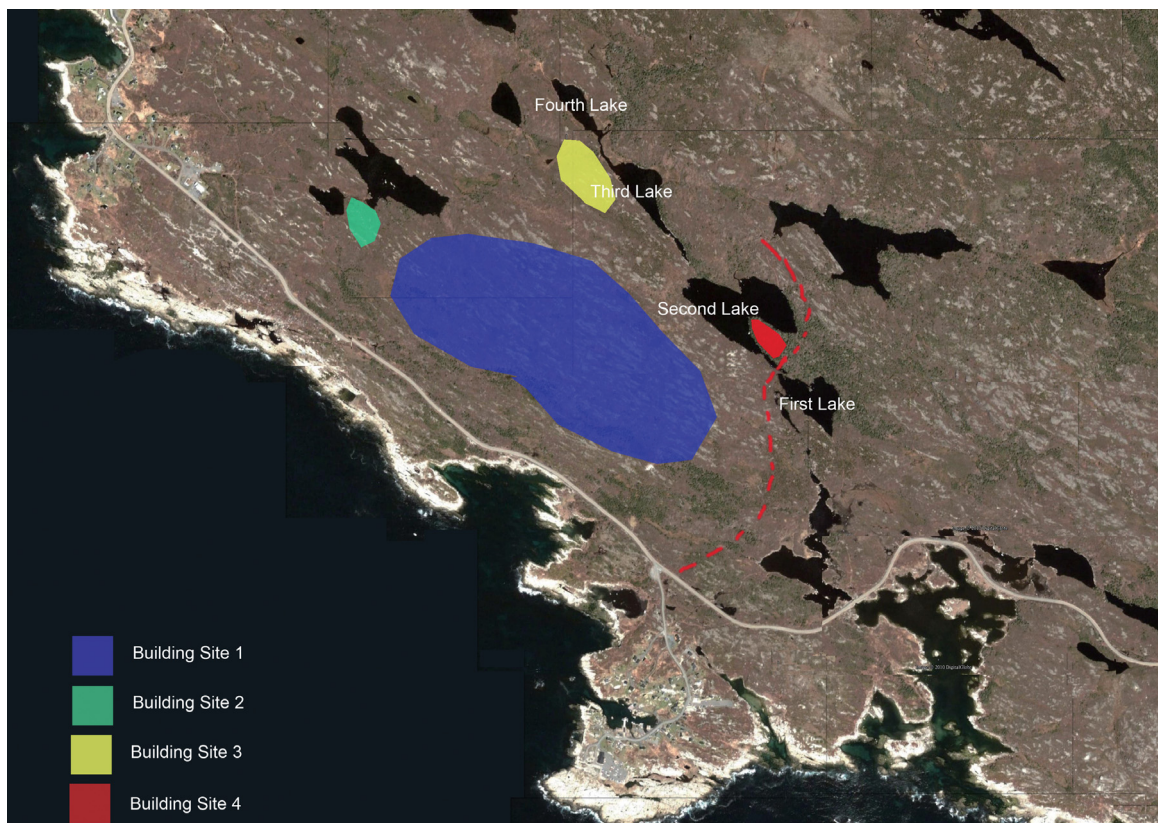
Concept Drawing of System Schematic and Components



Drawing of Shaw Peat Modular Peat System.

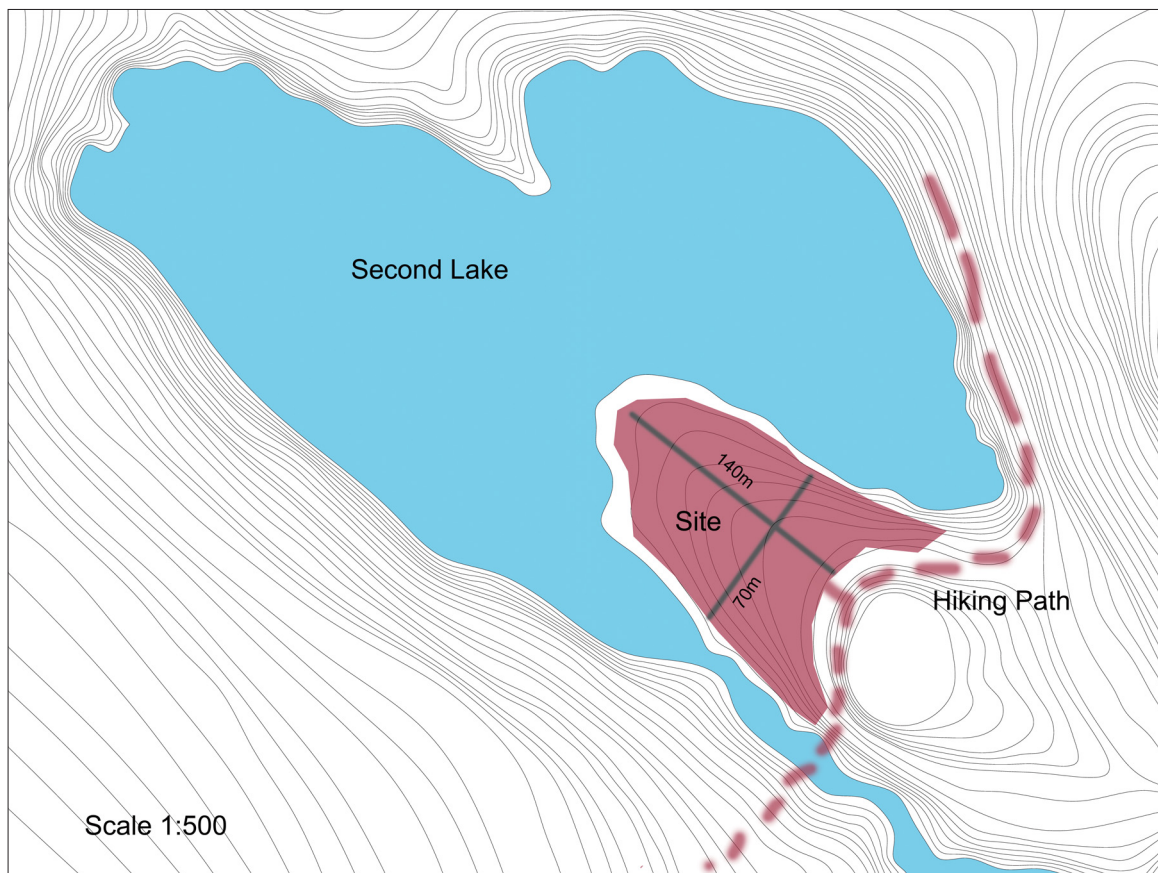
FINDING A BUILDING SITE

To find a better site for this meditation centre, four locations were selected for analysis. Building site 1 (blue) is an exposed area with high elevation, so high wind impact is the main issue. Building site 2 (green) is too close to the road and lacks privacy. Building site 3 (yellow) is too far from the road, requiring people to spend more time and energy to cross the drumlin to get there. Building site 4 (red), located beside Second Lake, connects to an existing hiking trail. It is a convex outcropping of bedrock.



*Site Selection: the red dash line represents the existing hiking path.
Scale 1: 8000 from Google map*

I decided to put the Meditation Centre in building site 4, which is 140 metres in length and 70 metres in width. The first reason is because Second Lake can serve as a water resource for the building. Secondly, the drumlin, which is about 49 metres above the water level, will protect the site from high-speed southerly winds. Compared with the other locations along the interior lakes over the drumlin, this location provides more privacy, and it is easier to approach because, although it is isolated from the land by the lakes, it is connected to an existing hiking trail.



Site Map Drawing. Scale 1:500.

CHAPTER 3: DESIGN

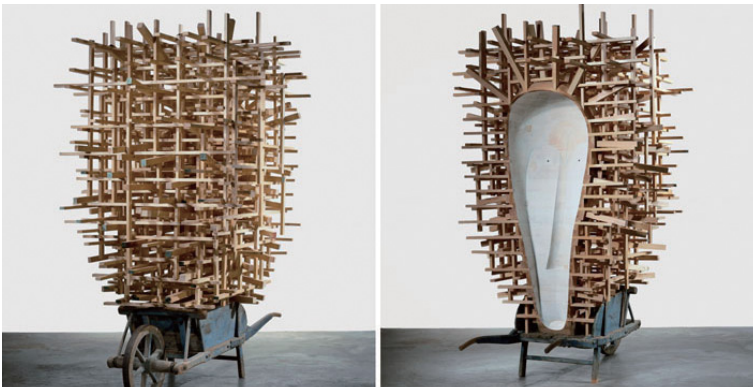
INTENTION

The design intention of the New Meditation Centre is to express the idea of mind-body awareness in terms of the material and tectonic awareness inspired from the site.

To do so, two things need to be investigated: the mind-body awareness theory and the material and tectonic experiments corresponding to the theory.

MIND-BODY AWARENESS

As a person who is practicing meditation, he or she has an awareness mind: an “awakening to the possibility that there is more to what’s in front of you than meets the eye” (Discoe & Quinn 2008, 11). A person who is not practicing meditation has an open mind, one without preconceived notions of the things ought to be. For example, if a person looks at the sculpture C.F.A.O (Compagnie of West Africa) by Martine Puryear, with a beginner’s open mind, one is able to see the white space at back with a fresh perspective. But with an awareness mind, just by looking at the front face of this sculpture, one could notice and visualize the back space, including each individual piece and how they match together, depending on the level of awareness mind.



Sculpture C.F.A.O 2006-2007 by Martine Puryear. From NEO2 Blog.

MATERIAL AND TECTONIC AWARENESS

The world is full of signs and information, which stands for things that no one fully understands because they, too, turn out to mere signs for other things. The real thing remains hidden. No one ever gets to see it (Zumthor 1997).

NEGATIVE SPACE

This experiment is to cast a piece of natural rock from the site by using plaster. The negative space which the rock does not inhabit becomes a space allowed to us. This induces an idea that form and space are interrelated without form, there is no space, and vice versa.



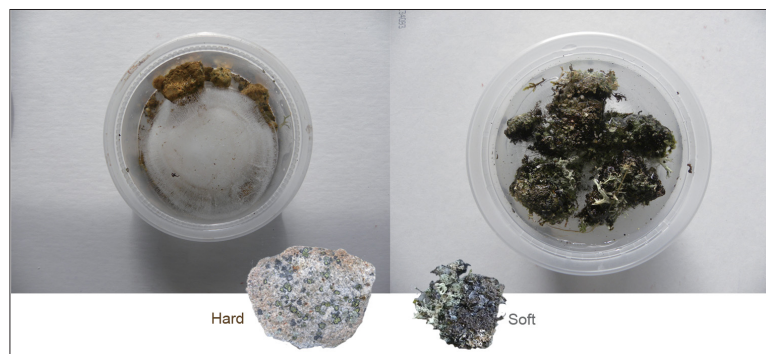
Natural rock from the site.



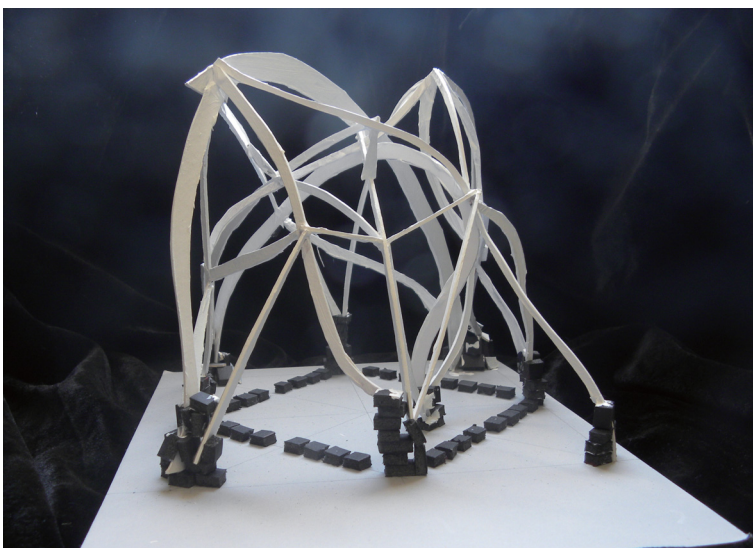
Casting the rock by plaster.

BUOYANCY: A STRUCTURAL EFFECT OF ARCHITECTURAL FORM

When the hard stones and soft vegetation are put into water and frozen in the fridge, the stones sink to the bottom and the vegetation rise to the surface. This experiment tests different material properties to explore new forms of architecture, inspired by “buoyancy”. The property of buoyancy might express the effect of a virtual, incarnate sensibility upon the formal aesthetics of the material architectural world.



Material Buoyancy Testing: Hard Rock vs. Soft Vegetation.



Concept Model: Buoyancy Form Expression. Scale 1: 50

TECTONIC STUDY

The studies explore materiality, tactility and fabrication processes. A small tree branch from the site, for example, when it is transformed by burning, affects human perceptions differently. These experiments aim to make the relationships between material and fabrication and form and process evident. The Brother Claus Field Chapel by Peter Zumthor is one architectural precedent that has used this tectonic method of burning:



Burning Wood Branch.

A technique called “rammed concrete” where farmers poured a layer of concrete over a teepee of timber every day for 24 days, leaving a texture similar to that of rammed earth. The timber was then burnt out by colliers, using the same process as making charcoal, leaving a charred inside. An oculus at the top is open to the sky letting in rain and light. Filtered light also enters through holes in the wall (ARC space Organization 2007, para. 2).



Brother Claus Field Chapel Photo by Thomas Mayer. From ARC space. com.

CHARCOAL FACADE STUDY

This experiment aimed to design and make a charcoal panel, building on my previous material and tectonic studies. Charcoal was chosen as a facade element for two reasons: First, its microstructure renders it an amazingly purifying material under the microscope, one can see that charcoal has countless micro cavities oriented in many directions, in fact, one gram of charcoal contains a surface area equal to one tennis court. Charcoal walls, therefore, can absorb humidity, odor and noise, excellent qualities for a meditation space. Second, the texture and smell of charcoal might ignite the viewer's perception and imagination towards human mind-body awareness into architecture. Two charcoal models have been made by casting concrete, making buoyancy forms, and burning wood.



Concept Model 1 _ Cube Volume in Organic Form.



Concept Model 2_Buoyancy: Curved Form.

CHAPTER 4: FINAL DESIGN

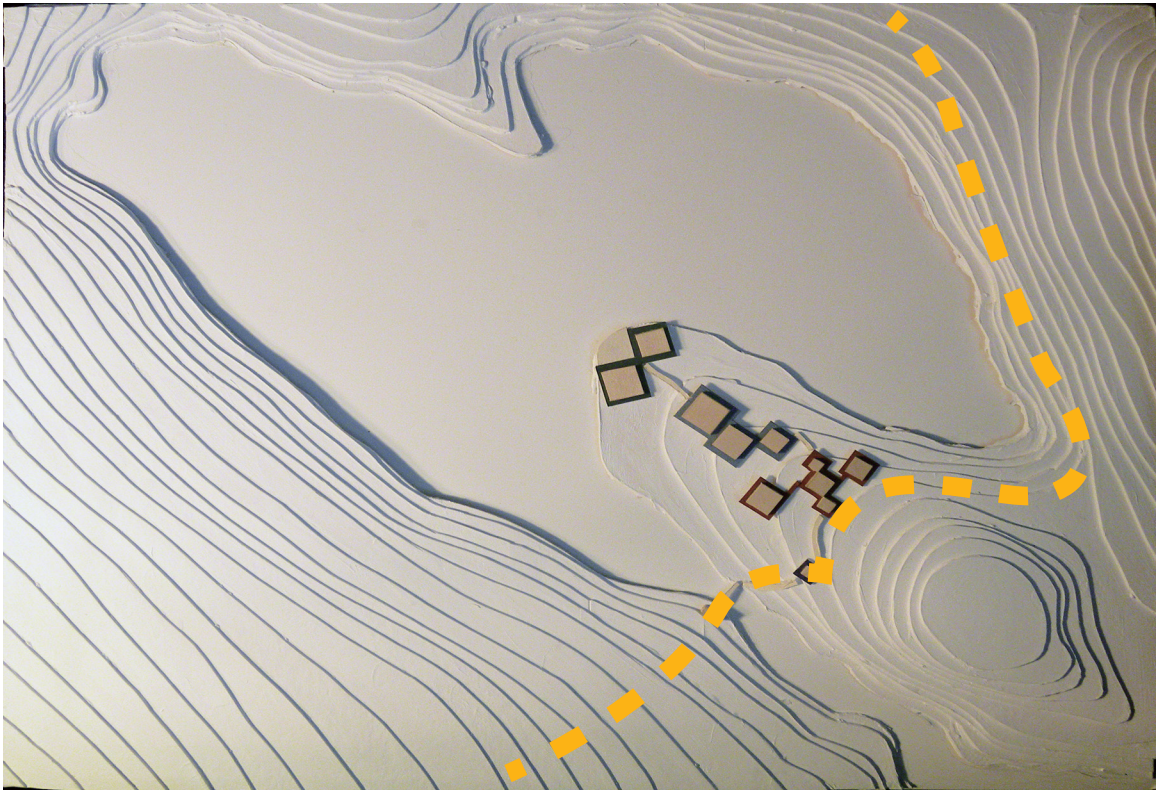
PATH AND INHABITATION

The site is inserted in the Second Lake, providing an isolated and natural environment. The main elements of the site are rocks and plants. The design diagram follows the path of the hiking trail to reach the site of the meditation centre, and the hiking trail as it continues onwards to connect with the other lakes.



Site perspective view at evening, Peggy's Cove, Halifax, NS..

The first conceptual site model shows a path running from the trail to the farthest end of the promontory, connected to each room. In this scheme, the path interfaces with a continuous sense of nature flowing between the rooms.



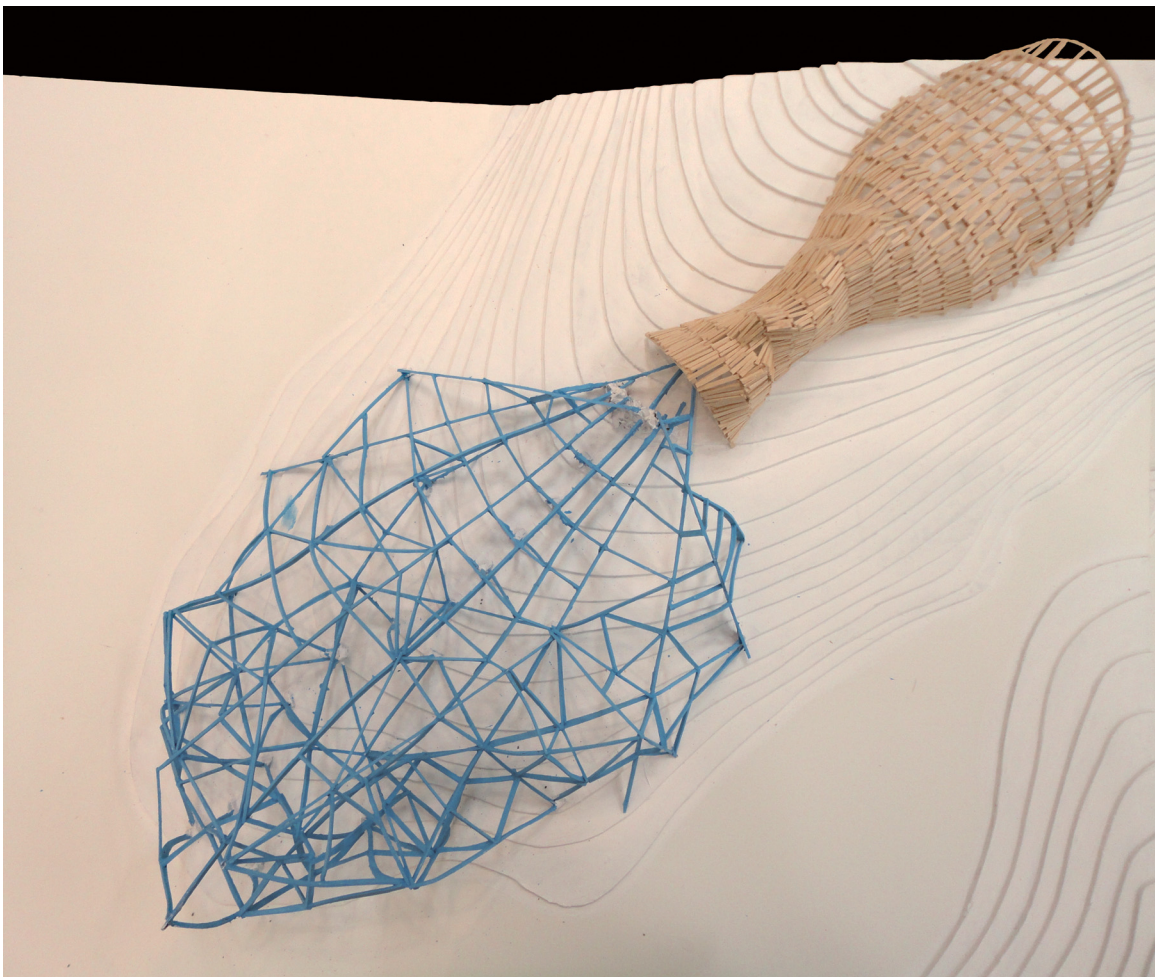
The yellow line represents the hiking path. Concept site model, scale 1:500.

To solve this dilemma, a second conceptual site model was developed. In this scheme, a continuous volume rises out of the landscape, not only providing a direct connection to the land, but creating a gathering space for the meditation centre. Possible paths on the site are greatly multiplied by the development of a wooden net between the gathering volume and the Second Lake.



Concept model, scale 1:500.

The idea of the wooden structure stems from the experience of walking in the thickets that surround the site. This unique wooden “net” provides two functions: a structure to support and hold each inhabitation; and a circulation for people to interact with the landscape. Its unique form allows views and light to penetrate the structure.



Concept model, scale 1:250.



Walking in the thicket when hiking towards to the site.



Site view when hiking towards to the site.



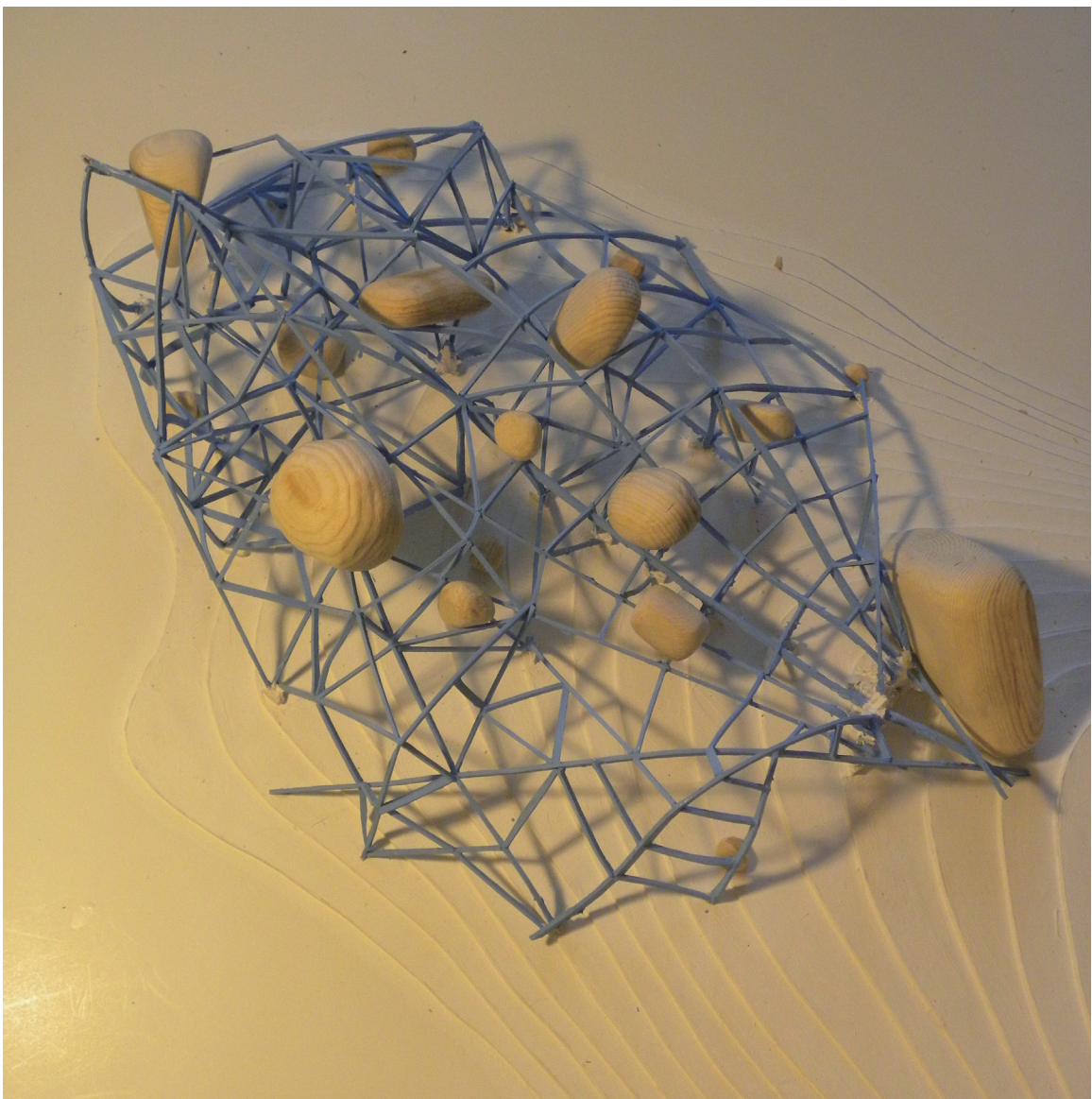
Site view when hiking towards to the site.

The beauty of Peggy's Cove exists in the empty space between nature, where rocks stand and plants flow. As such, the buildings themselves do not have to show any special shape in order to be unique. So the design idea for each inhabitation is to create a sculpted form that evokes the glacial erratics that dominate the region's landscape.



Concept Model: each erratic shape ball representing each meditation room, Scale 1:250.

The design for the new meditation centre design aims to express the idea of mind-body awareness in meditation: Each inhabitation space whether inside or outside the wooden net, whether visible or imagined, engages the viewers in an activity, even though their use or movement remains only imaginary. The instrumentality and engagement of the Meditation Centre extends beyond mere function.



Concept Model_ "flowing rocks" (inhabitation) and the complex thicket structure (path) Scale 1:250.

FORM, MATERIAL AND STRUCTURE

This meditation centre has three parts: the “floating rocks” (each one representing each program space), the gathering hall and the wooden “net”. Based on the material and tectonic studies in the previous chapter, the form, material and structure of the meditation centre will be developed.

FLOATING ROCKS

Learning from the exercises in casting negative space, I selected various rocks that have the same dimension as each program component, at a scale of 1:100. I then cast them by using white tissue paper and glue. The negative space, which the rock does not inhabit, becomes a space allowed to us while their exterior forms still resemble the glacial erratics.



“Floating Rocks” Scale 1:100.

For ease of construction and material expression, the “real” dwelling world have to be made of a light weight armature and cladding, because the rocky rooms must be light enough to be connected to the wooden “net”. A brown wooden cladding would also give viewer a sense of unity.



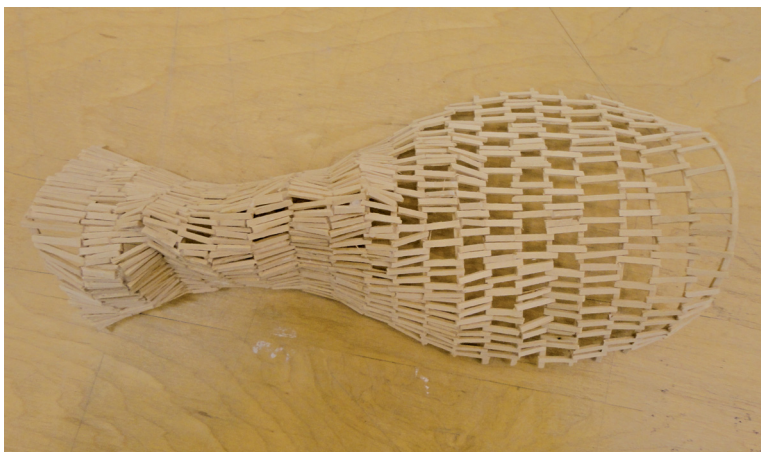
Rocky room in the wooden net. Scale 1:100

GATHERING HALL

The buoyancy experiment expressed the effect of a virtual discarnate sensibility on the formal aesthetics of the material world of architecture. To convey the sense of buoyancy visually, the design of the gathering hall is conceived as an organic form that emerges from the bedrock. Two concept models test the idea of “flowing up”. The first one imitates the dynamic expression of the magma which forms the bedrock, and the second one is constructed as a wood structure.



First Concept model of the Gathering Hall Scale 1:100



Second Concept model of the Gathering Hall Scale 1: 250

The structure of the gathering hall is inspired by the Pictou Landing Health Centre by Richard Kroeker as an architectural precedent. This building employs numerous low-impact strategies using natural materials, and a method of building with wood that is consistent with the Mi'kmaq techniques. As Kroeker notes:

By using round poles for the truss, the wood's cellulose strands are continuous from end to end and oriented in concentric cylinders, as they were structurally optimized by natural growth (Architecture Week 2009, para. 5)



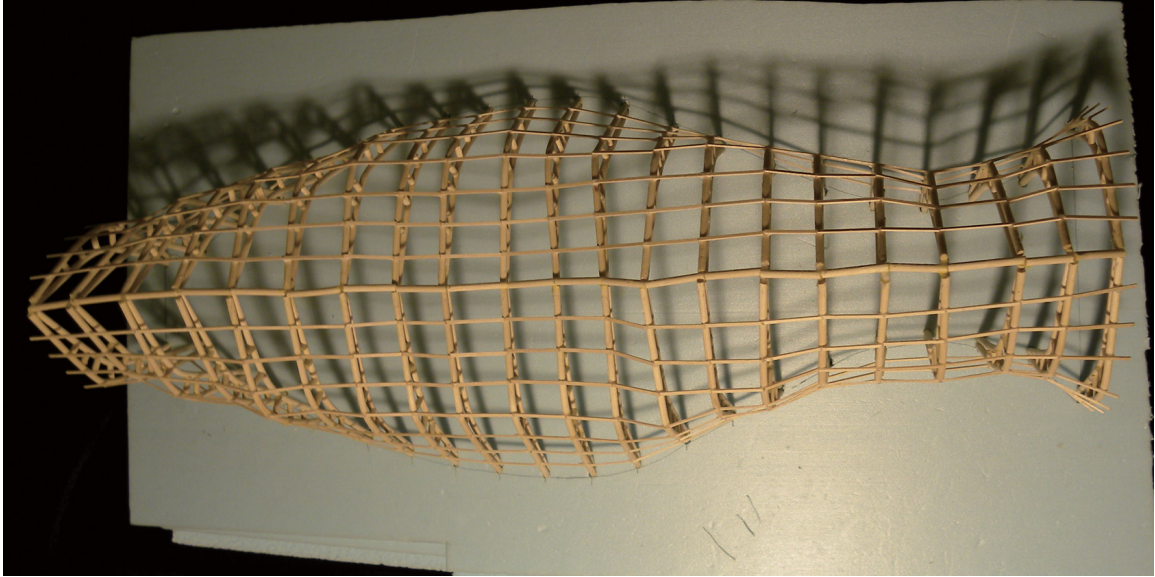
Interior Structure of Pictou Landing Health Centre. Photo by swvander22 From flickr.com.



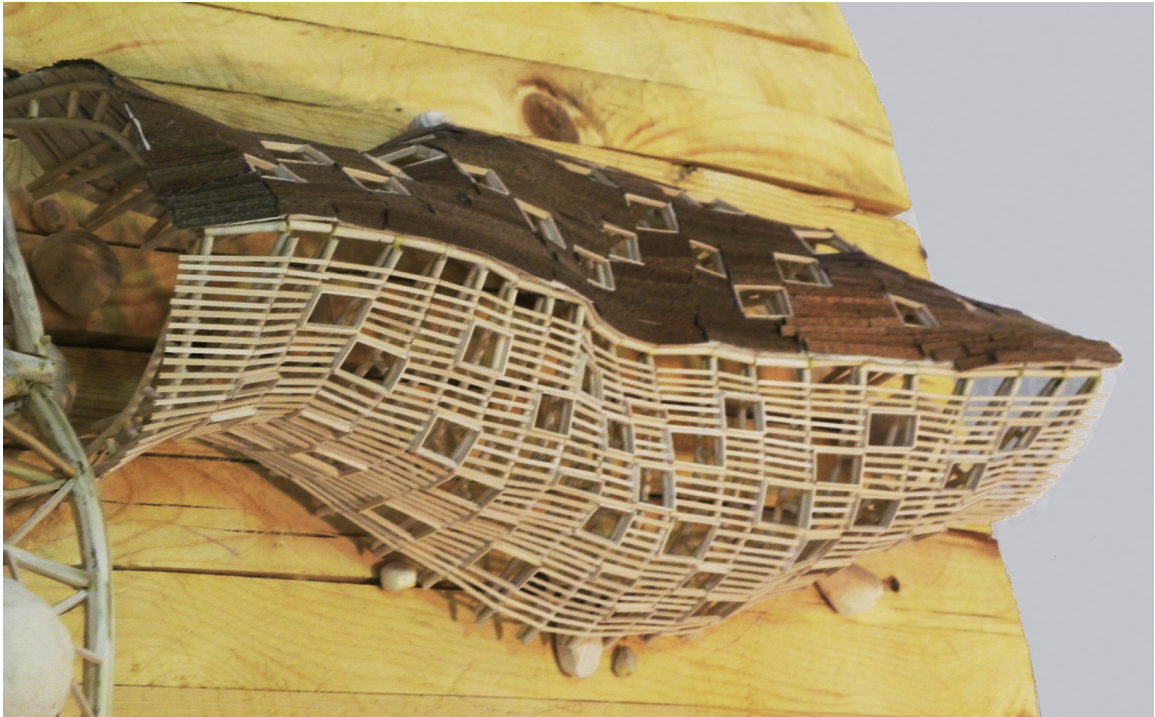
Detail of bentwood truss. Photo by Mark Genest. From Picasa blog.



Perspective view of Pictou Landing Health Centre. Photo by Paul Toman and Richard Kroeker. From e-architect.



Structure Model of Gathering Hall. Scale 1:100



*Model of Gathering Hall: wood truss, shingle cladding and rock foundation.
Scale 1:100*

WOODEN “NET”

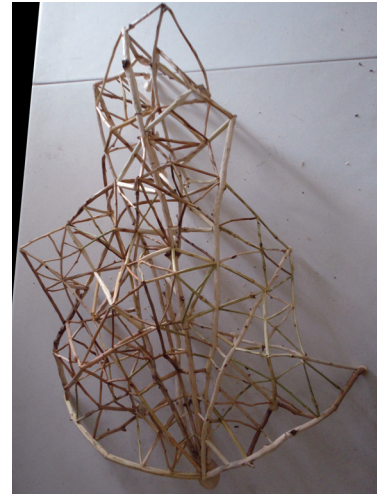
The structural system of the wooden “net” is made from the local trees with a diameter between 100 - 1000 mm. The length of the logs would vary from 2 - 15 m. For the construction, I would first distribute the rocks in the centre and the edges of the site, and then add more rocks among them to minimize the distance between rocks. The trees of different lengths are inserted in the rocks to build a main structure, and the logs with smaller diameter are connected to it for bracing. Once the structure is finished, those “floating rocks” will either sit on the net or under it. Part of the wooden “net” will be cladded based on the programs and the function of the “floating rocks”.



Final model developmen_Layout the rocks on the site. Scale 1:100.



Final model development_Construct and connect tree members. Scale 1:100.



Thicket Wooden “Net”. Scale 1:100.

FINAL MODELS AND DRAWINGS

The new meditation centre has two parts: a wooden net with floating erratic rooms distributed and the gathering hall with three charcoal sculptures creating boundaries for different space. In the wooden net, three different level meditation rooms are distributed in the net. The lower level meditation rooms are larger and closed to the entry for the beginners' convenience because group meditations are required in this level. As the meditation level goes higher, the rooms are smaller and far from the entry, because the meditators need more privacy and longer time for meditation. The wooden net also provides paths and circulation for outdoor walking, sitting and standing meditation.

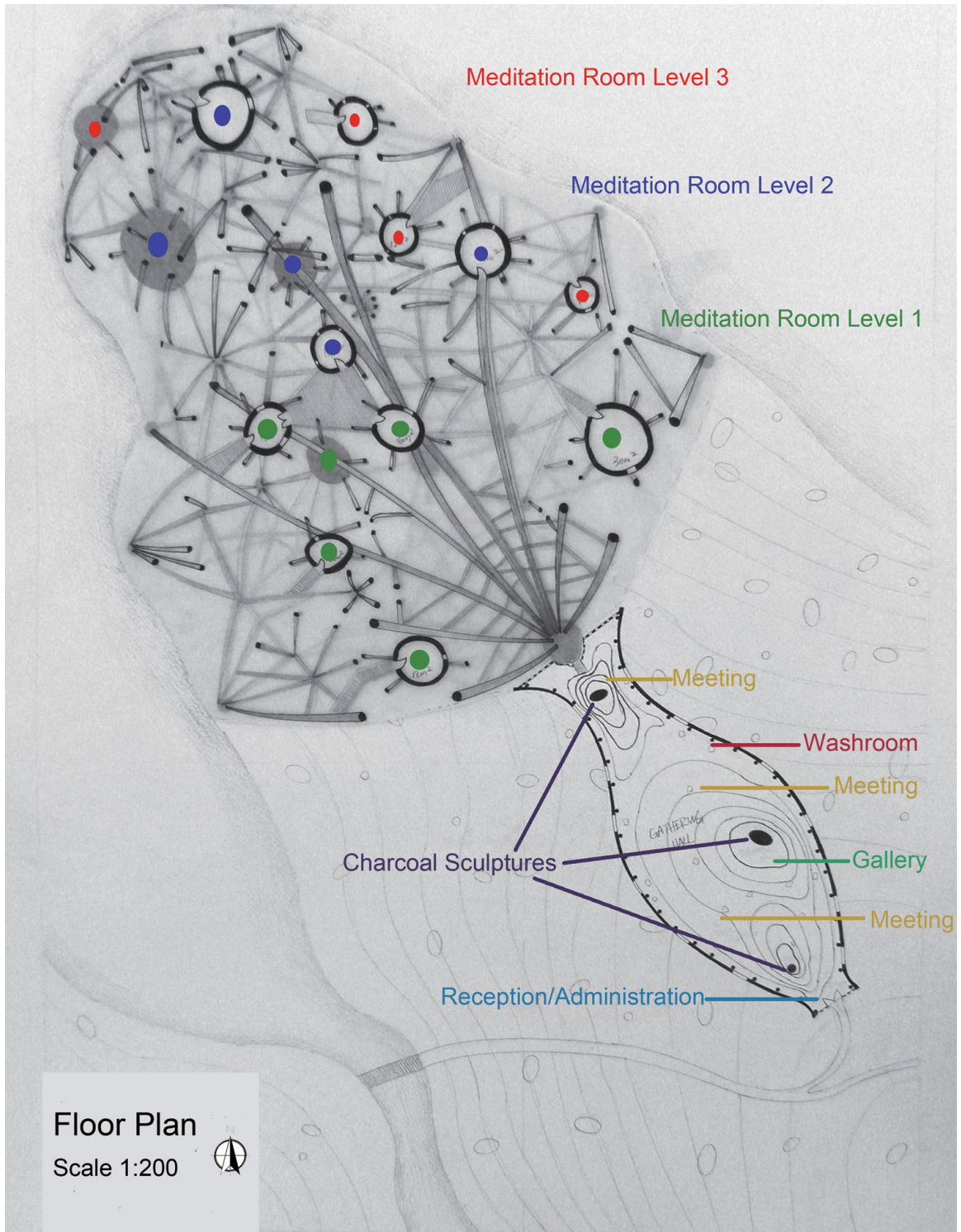
Programs:

Wooden Net	Number	Diameter (m)
Meditation Hall (Level 1)	6	5
Meditation Hall (Level 2)	5	4
Meditation Space (level 3)	4	3
paths	9	
Outdoor Space	75%	

Table of programs in the Wooden Net

Gathering Space	Number	Total Area (msq)
Charcoal Sculpture	3	300
Gallery	1	
Meeting	1	
Administration	1	
Reception	1	
Electrical	1	
Washroom	2	

Table of programs in the Gathering Space



Floor Plan. Scale 1:200



Wooden Net

Gathering Hall

Section

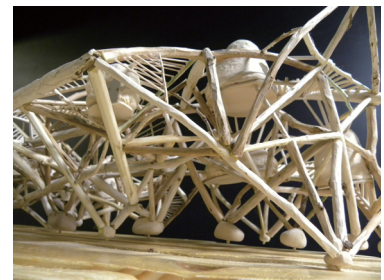
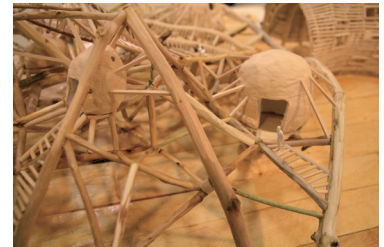
Scale 1:200



Floor Plan. Scale 1:200



Final Model. Scale 1:100



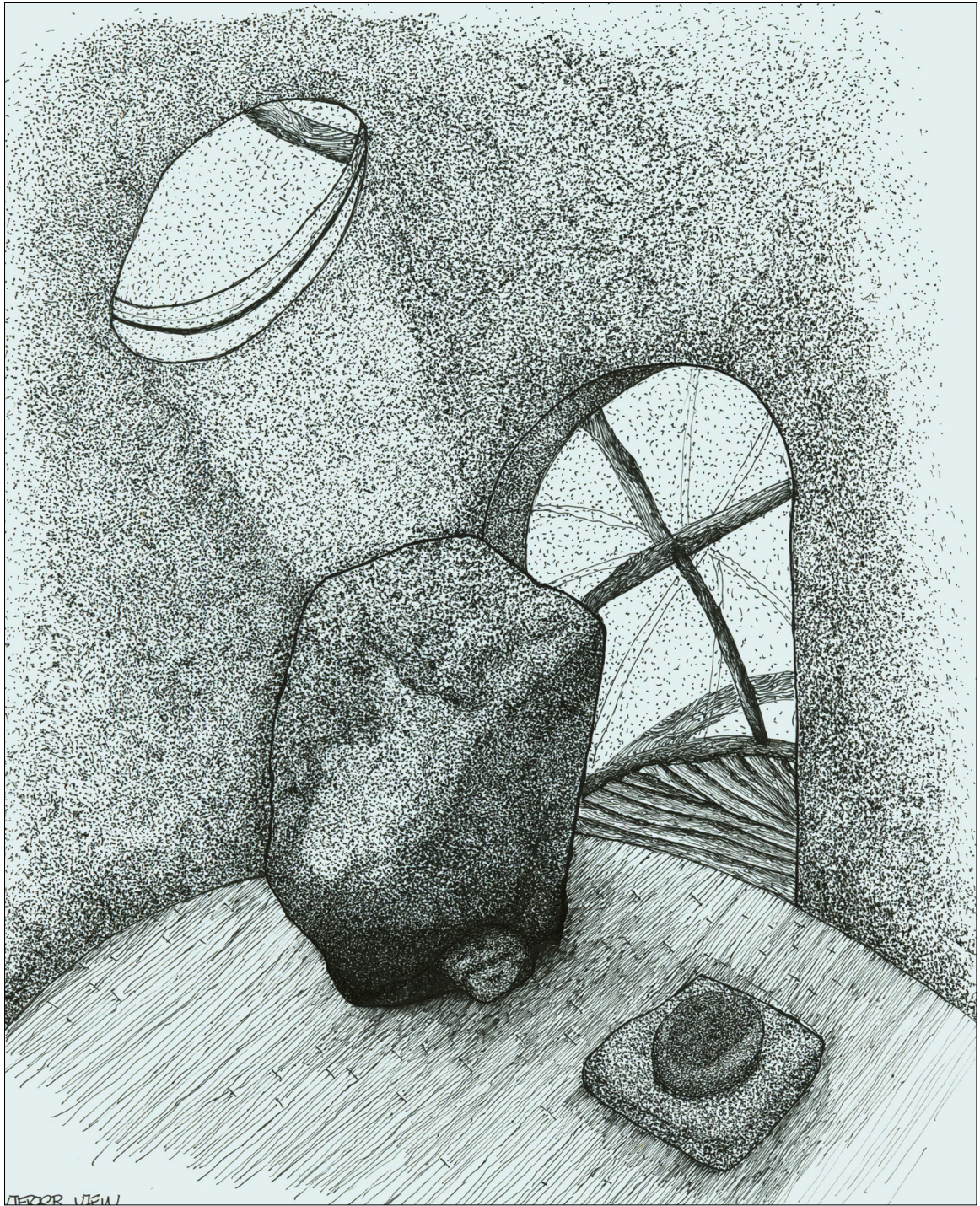
Different views of the meditation space in the wooden net. Each space whether inside or outside the wooden net, whether visible or imagined, engages the viewer in an imagined activity, even though their use or movement remains only imaginary.



"Magma glowing up"_ Charcoal wall sculpture in the Gathering Hall.

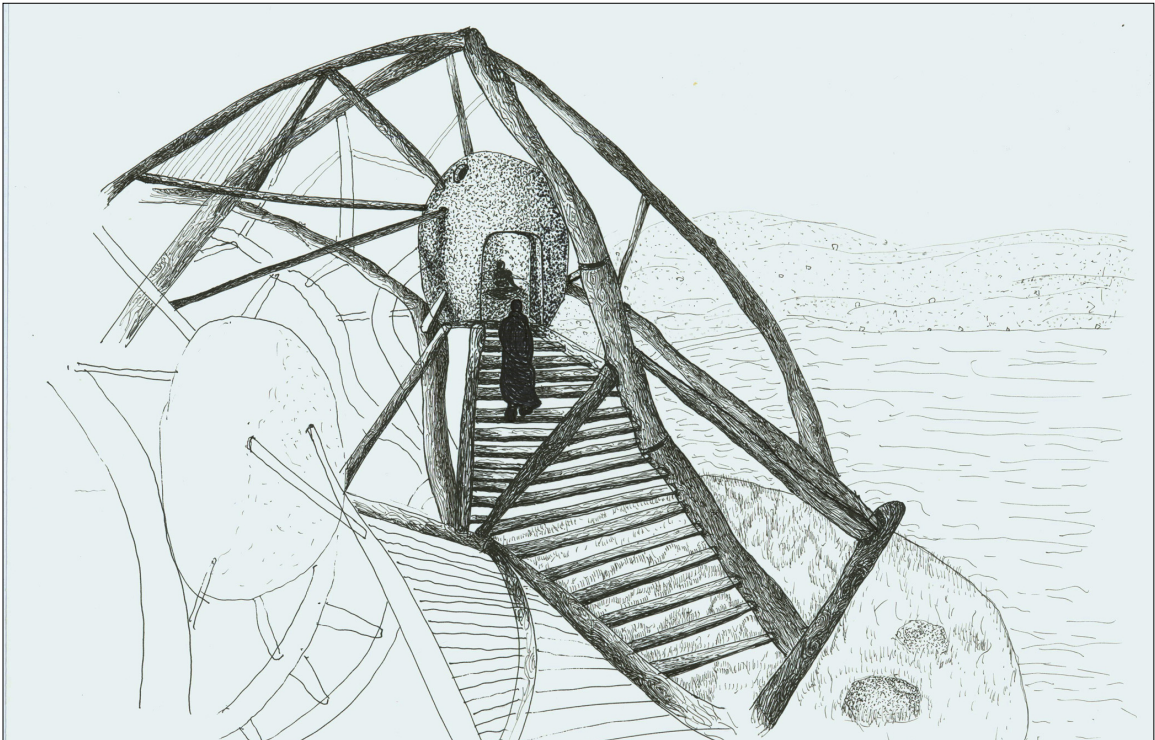


The ground counter line steps in the gathering hall. Each step is 25 cm in height.

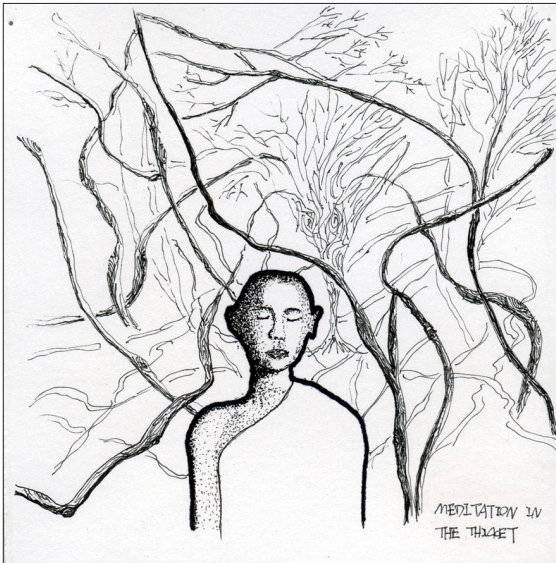


INTERIOR VIEW

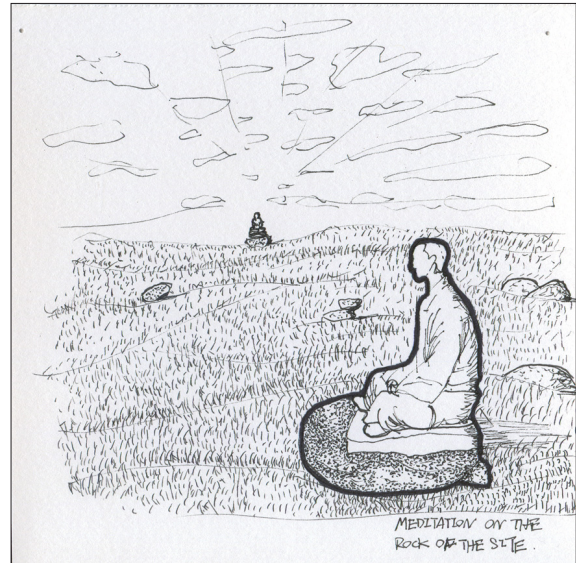
Interior view in a meditation room.



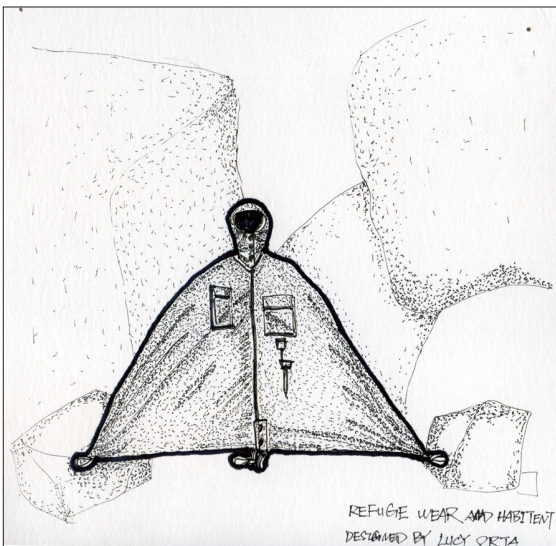
Drawings of different meditation space



Outdoor meditation in the thicket



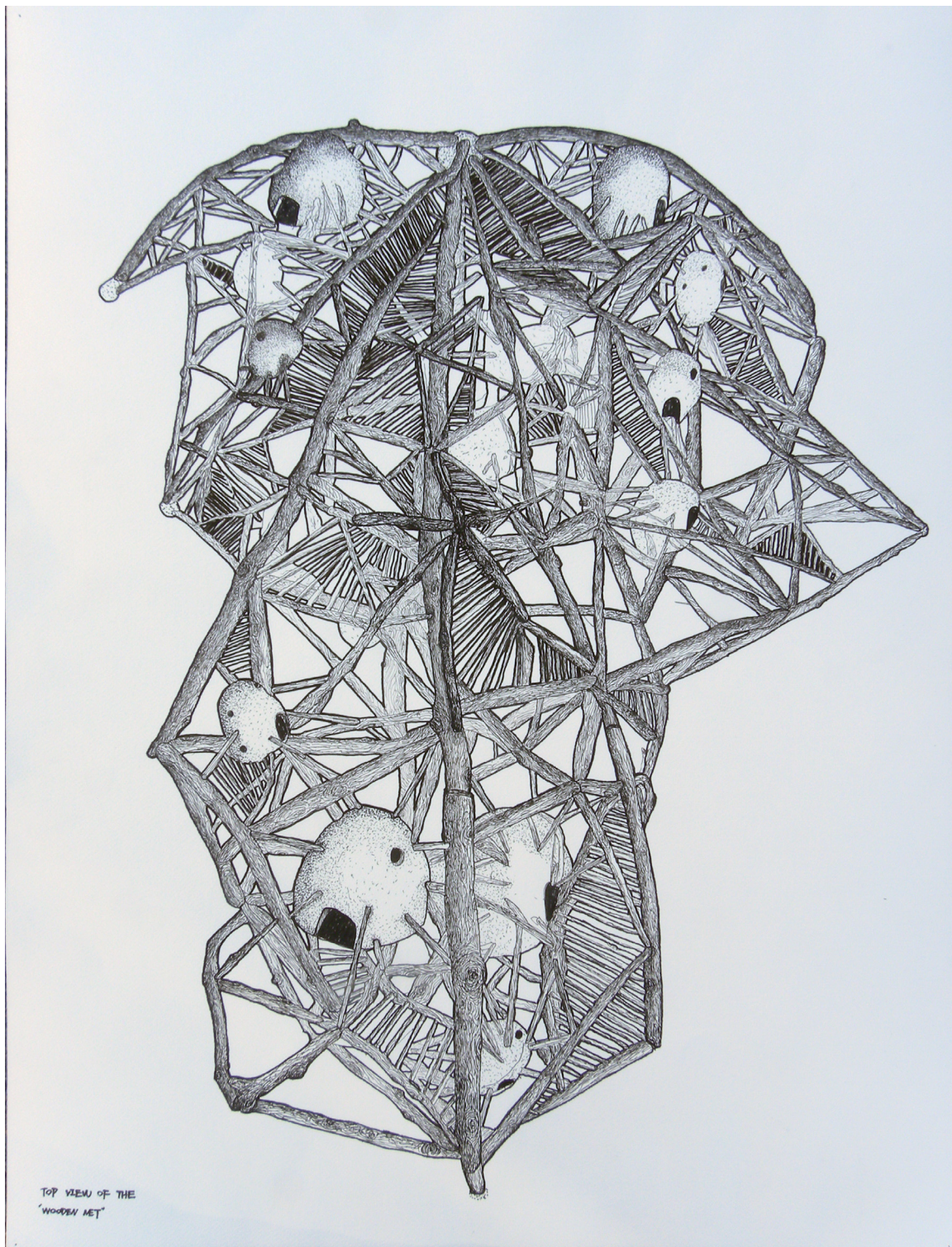
Outdoor sitting meditation on the rock



Refuge wear for the meditator



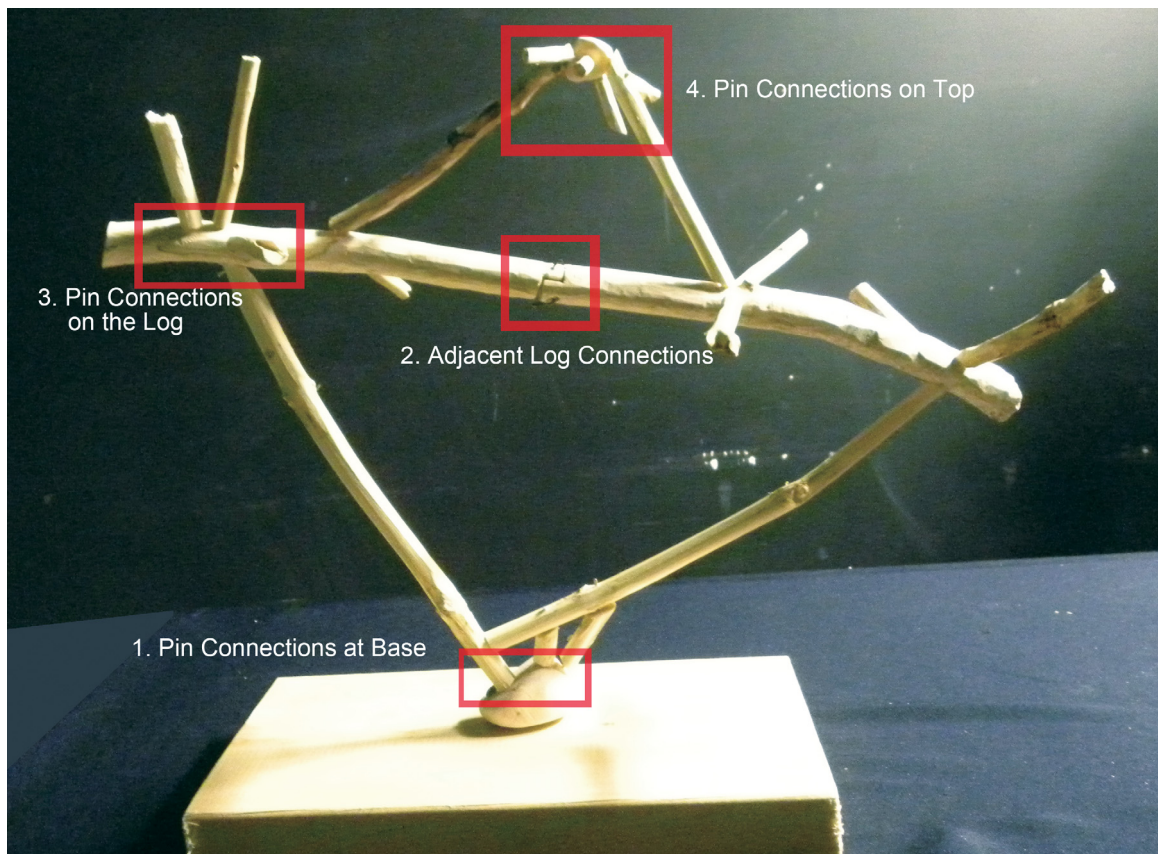
Outdoor standing meditation on the drumlin



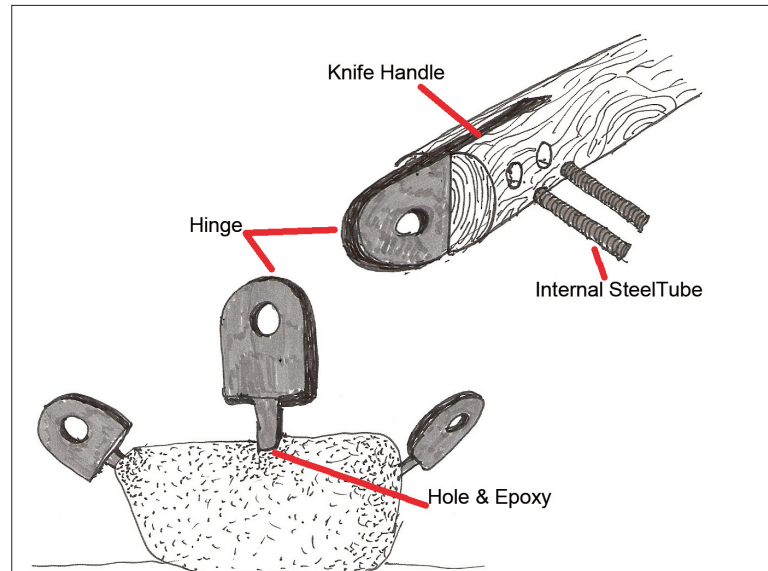
Perspective drawing of the wooden net with the meditation rooms

DETAIL CONNECTION

For the detail connections, pin connections are preferred since they eliminate the bending moment created with rigid connections. This model illustrates four different connections in the net.

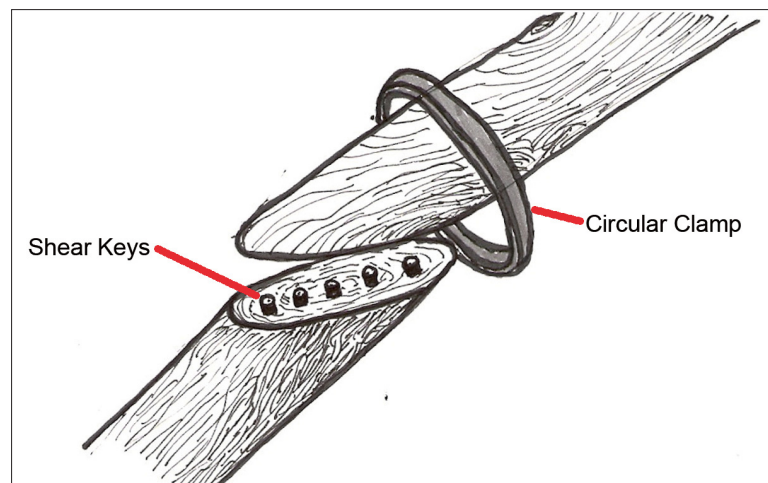


Detail Connection Model. Scale 1: 50



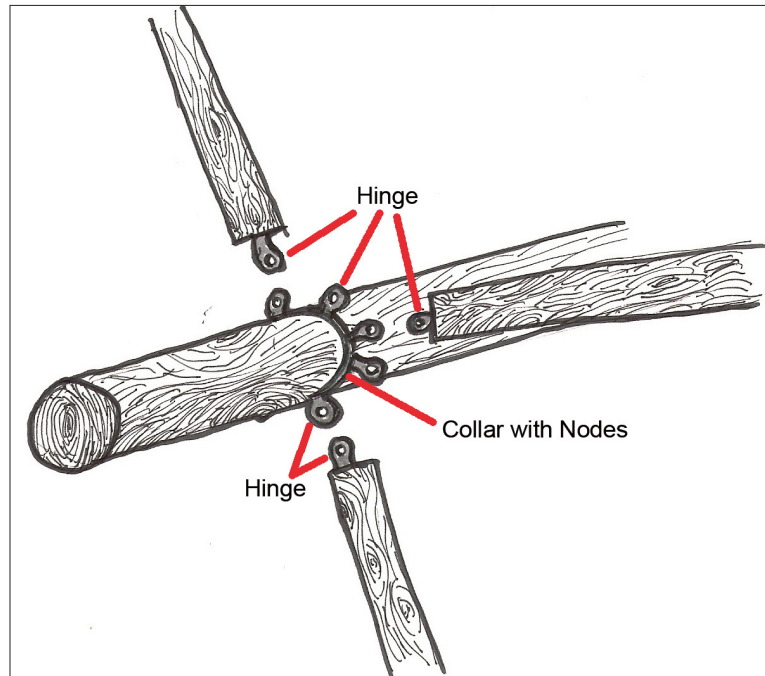
1. Pin Connection at Base

Drill a hole in the rock and embed a metal plate with epoxy adhesive. Its counterpart is cut into the log, and the two plates are fastened with pin bolts.



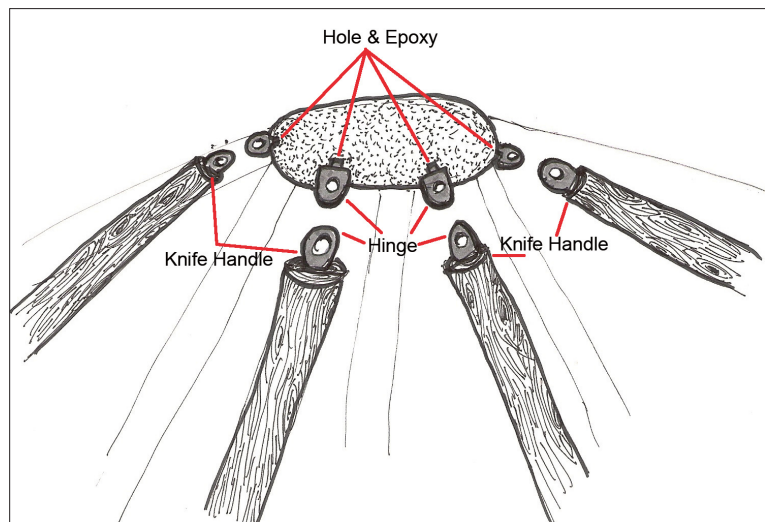
2. Adjacent Log Connection

Add shear keys between the internal surfaces to prevent shear failure, and then tie circular clamps on the exterior.



3. Pin Connections between Logs

To avoid compression stresses created by pin penetrating the log, it is ringed by a collar with lugs which connect plates from incoming logs.



4. Pin Connections on Top

Depending on the configuration of joint condition in the thicket structure, logs will meet in various angles with each other. The idea for the top connection shown above is to use the natural rocks, which dominate the Peggy's Cove area, as connectors. The strategy is similar to the pin connection at the base.

CHAPTER 5: CONCLUSION

RESPONSE TO ORIGINAL THESIS QUESTION

How can a New Meditation Centre be designed at the Peggy's Cove Area in terms of material and tectonic Awareness?

This thesis first introduces the meditation theory and Peggy's Cove Area at Halifax in broader perspective. Then it investigates the site from a geologist's point of view, exploring the bedrock which tells us about geologized history plate movements and the material transformation through both physical and chemical actions.

The site investigation inspires a distinctive interpretation of the characteristics and develops a series site object models in terms of material and tectonic awareness. Meanwhile, the mind-body awareness from the meditation theory is explained.

Based on the meditation theory and site study, the final product is an architectural vocabulary specify to the Peggy's Cove area. However, the principle and material tectonics awareness uncovered induce a principle - nature already includes everything. Whatever we do should follow the law of nature. Although the thesis has reached a conclusion, the meditation theory and the exploration of material and tectonic study will be continued.

POTENTIAL DIRECTION FOR FURTHER STUDY

This thesis is an initial attempt at interpreting meditation theory within architecture and, consequently, is an introduction and an experiment to a complex subject. The imagined architecture space, in this case, is beyond the mere function and form.

Our eyes do not divide us from the nature, but unite us with it. The world is abundant. we require only a deference born of understanding to fulfill man's promise. We are uniquely conscious creature who can perceive and express. The Peggy's Cove at Halifax offers a rich history and attractive views to be realized materially. In order to discover the intrusive beauty of it, we should respect and design with nature.

APPENDIX:

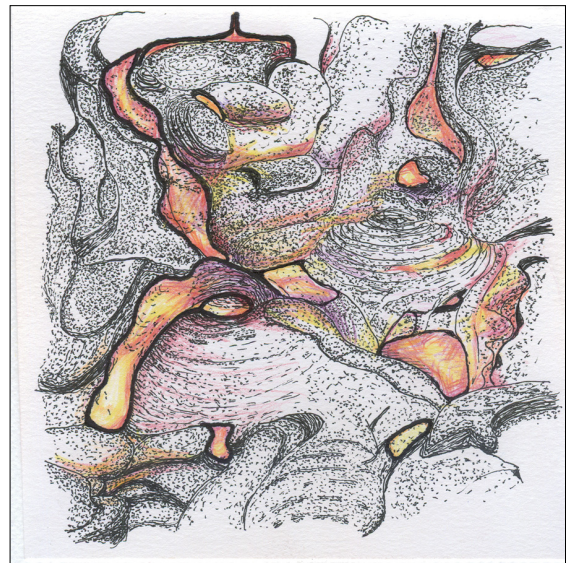
CHAPTER 2:

GEOLOGY STUDY

The earth was formed around 4.6 billion years ago as a mass of gaseous magma. Over the next 500 million years, magma slowly crystallized and hardened as a crust, and vapors escaped from the inner, forming thick clouds and condensing into the first rain (Rosmana 2009, para. 1).



Drawing of magma 4.6 billion years ago.

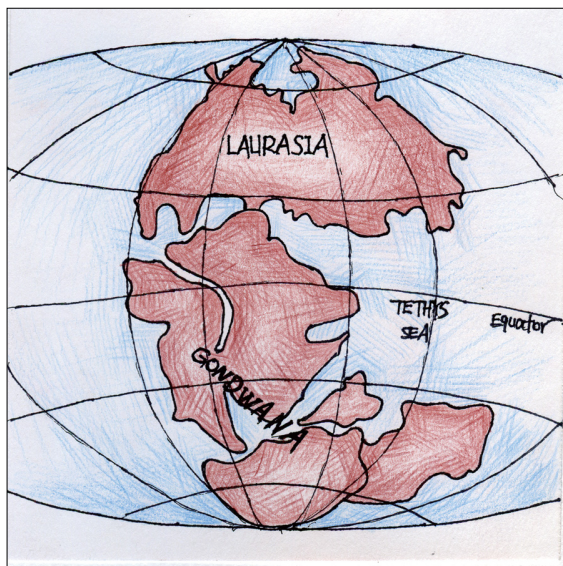


Drawing of liquid rocks and flowing magma 500 million years ago.

This long and heavy rain further cooled the Earth's surface and created a giant ocean surrounding the supercontinent "Pangaea". About 200 million years ago, Pangaea was separated into two supercontinents: Laurasia and Gondwana.

As the cooling surface continues to move in plates, the continent of the Gondwana pulled away from its original location at the south pole position and moved. Peggy's Cove was once in the Gondwana near the equator and recovering from the intercontinental collision.

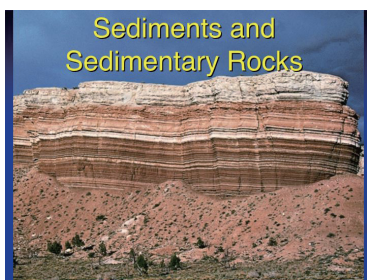
As Gondwana moved east and south, rock was dragged and dropped along the way, making for the ragged, rugged coastline Nova Scotia is famous for. What was left jammed into North America was essentially once part of Africa. So the rock that is in Peggy's Cove today is of the same substance as that to be found in Morocco if you were to go there and dig beneath the sands (Choyce 2008, 14).



Drawing of Earth Ocean and Continent 225 million years ago.



Drawing of Gondwana forming into plates 200 million years ago.



Sedimentary rocks. From RST, Six Fundamental Concepts about the Earth's Geology



Metamorphic rocks. From Classifying Rocks and Minerals.



Plutonic Rock. Peggy's Cove Halifax, Nova Scotia.

BEDROCK CLASSIFICATION

There are mainly three kinds of bedrocks - sedimentary, plutonic, and metamorphic rocks. These types can be thought as “fire rocks”, “water rock”, and “altered rocks” (Williams 2001, 13).

Sedimentary rocks, such as sandstone and limestone are formed by sedimentation of material at the Earth's surface and within bodies of water.

Metamorphic rocks are formed through a process of changing. As a result of pressure-cooking, their physical properties have been changed. An example is marble.

Plutonic rock, like the rocks in Peggy's Cove, is an intrusive igneous rock body that has crystallized from magma slowly cooling below the surface of the earth. Plutonic rocks may solidify many kilometers below the surface, and magma cools extremely slowly to produce coarse crystalline rock such as granite.

ROCK EXCAVATION

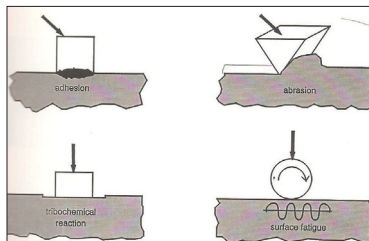


Controlled Foam Injection. From CA-MIR, Controlled Foam Injection.

Rock excavation is a necessary process if a building is constructed on bedrock. The traditional methods of excavation is to blast or explode the rocks, but those methods take too much energy and cause damage to the environment. Controlled foam injection is a new non-explosive method to excavate hard rock, which has been developed, tested and demonstrated by Chapman Young in a mining environment.

The method uses high-pressure foam to initiate, pressurize and propagate controlled fracturing in rock. The foam is injected to the bottom of a relatively shallow pre-drilled hole in the rock to be broken by means of a barrel incorporating a whole bottom sealing method (Young 1999).

This method takes less energy and reduces damage to the environment.



Four basic wear mechanisms are adhesion, abrasion, tribochemical reaction and surface fatigue (Deketh, 1995).

Meanwhile, wear of rock cutting by human forces might be applied. The process of rock cutting involves different types of motion contact between rock and tool, causing different kinds of damage to the cutting tool. According to Zum Gahr (1987), the categories of motion are rolling, sliding, oscillating, impact and flowing. The wears of cutting tools are chisels, picks and bits. There are four basic wear mechanisms - adhesion, abrasion, tribochemical reaction and surface fatigue.

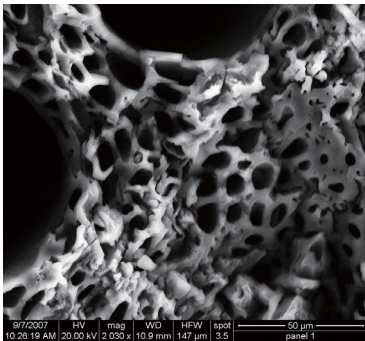
CHARCOAL FILTER WALL MAKING

Charcoal can be made from any number of natural materials, hardwoods such as coconuts, bamboo, willow, hickory, mesquite, oak, maple, and fruitwoods are favored. They have unique aromas and tend to produce a better grade of charcoal. Better grades of charcoal come from raw materials with low sulfur content.

Charcoal Microstructure

Charcoal has a hexagon microstructure which has less perimeter but bigger area. The holes in charcoal's surfaces absorb the waste matter and dirt attached to skin, pores, and fur. This experiment is to build a hexagon structure to support the charcoal panel.

Charcoal Panel Making

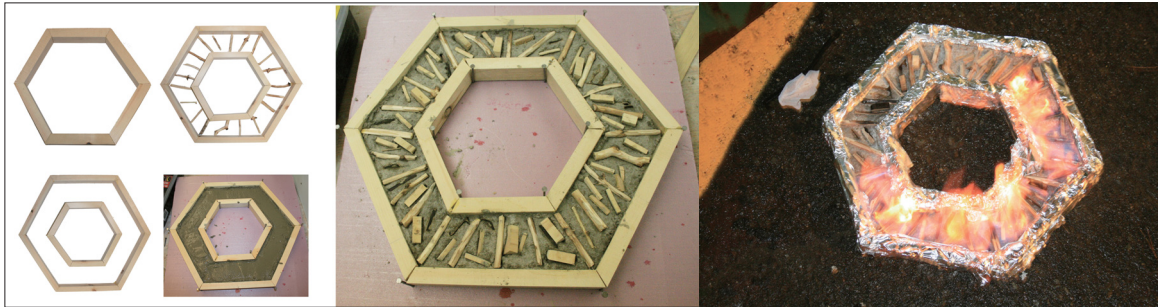


Electron microscope photograph of charcoal surface magnified 1000 times. From Bamboo-Charcoal.



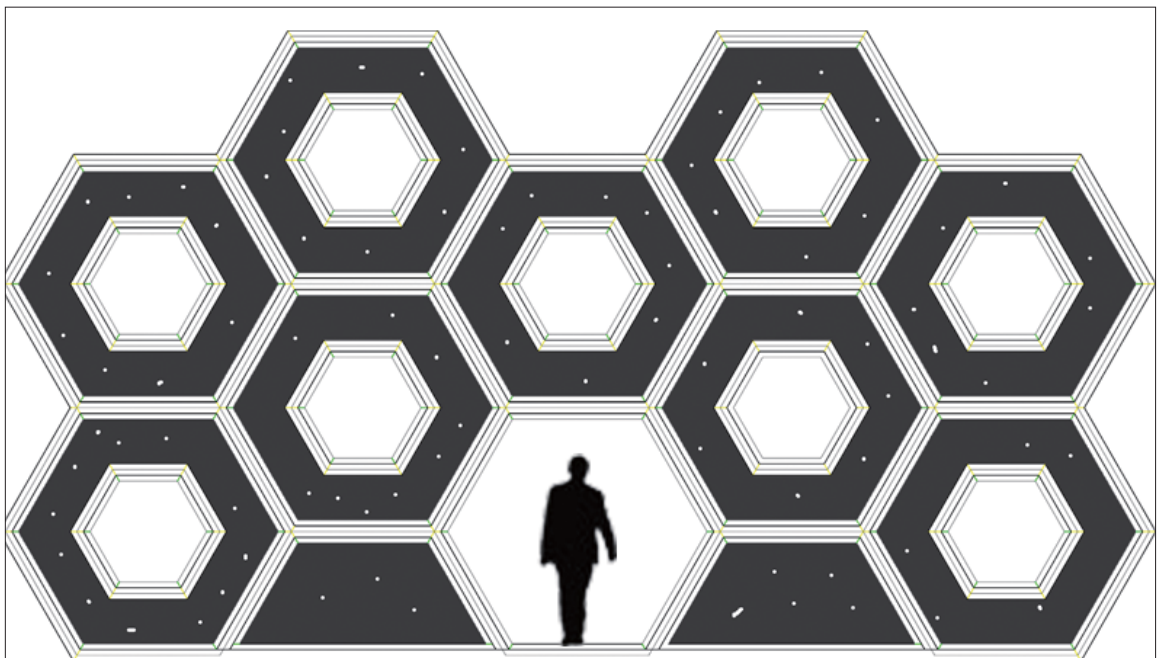
Structure Model. Scale 1: 5

For the hexagon panel making, the concrete is poured on a wooden frame. Wood pieces are inserted, which will be later burned into charcoal.

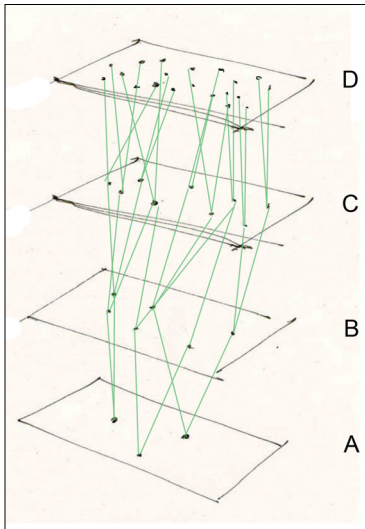


Charcoal Panel Making

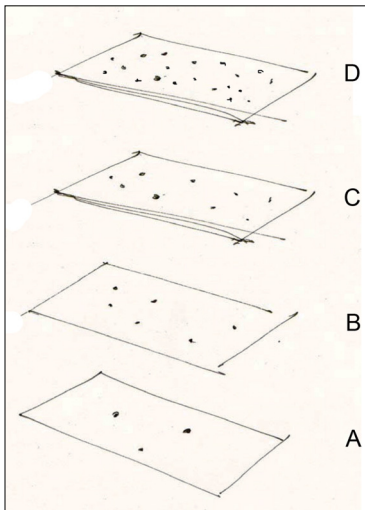
After the charcoal panels are finished, they are fixed into a hexagon structure to make a charcoal filter wall.



Drawing of Charcoal Structure. Scale 1: 100.



Random points in plans



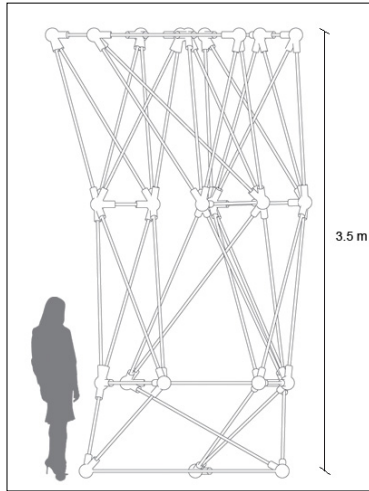
Points connecting in adjacent planes

PARAMETRIC DESIGN SUMMARY

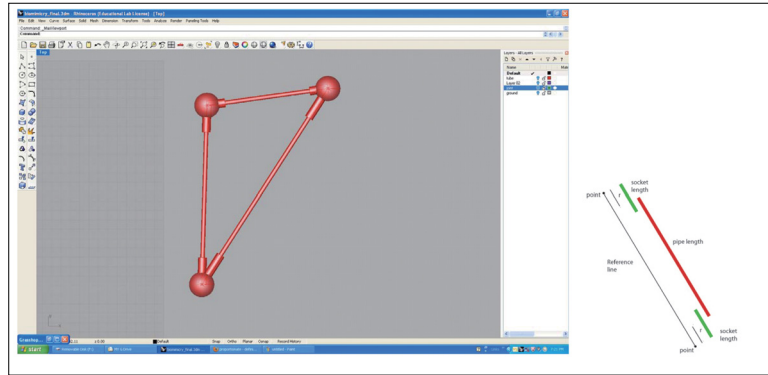
Student group work by Colin Harper, Husain Alabdulrazzaq and Zhe Wang

This course asks students to survey and undertake research in computer-based architectural models and computer-assisted manufacture, logistics, and construction. Each group is responsible for choosing materials, making methods appropriate to the organism's primary function, and developing a computational design approach to a single architectural organism. In my group, we use Rhino and Grasshopper to generate a thicket model to hold an art object inside a pavilion.

Our idea for the thicket is that we first choose four planes A, B, C, and D vertically, and on those planes, points which are increased from the bottom level to the upper level are randomly located. Three parameters generate this thicket model: first, the parameter called "approximate" in the Grasshopper controls the number of connections for the points in each plane by setting a certain range of distance; secondly, the parameter called "pipe" gives the lines thickness. The longer the line is, the bigger the radius is; third, we use the parameter "Sphere" and "Socket" for the connectors. The longer the line is, the longer the socket should be.



Elevation of the thicket



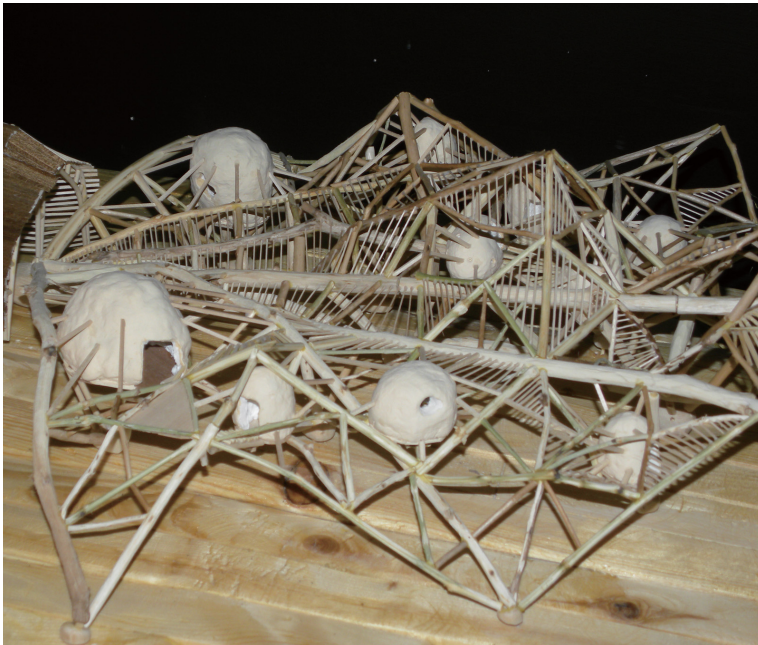
Socket connector



Model Rendering by Colin Harper

RELATIONSHIP BETWEEN PARAMETRIC DESIGN AND THE MEDITATION CENTRE DESIGN FOR MY THESIS

Parametric design defines buildings by mathematical equations. The wooden net of the meditation centre comes from the idea of a thicket on the Peggy's Cove site. From the point of view of parametric design, there two parameters need to be controlled. The first one is the number of connecting points and how they join. Reducing the number of points will increase the connections in each point, and balance tension and compression. But if there are fewer connecting points, the length of the log between two points will be too long and crack; the second parameter is the radius of the logs. The longer the log is, the bigger its radius.



Model of the Thicket Structure

REFERENCES

Architecture Week. 2009. Pictou Landing Health Center. http://www.architectureweek.com/2009/0114/building_1-2.html

ARC Space Organization. Brother Claus Field Chapel (photograph). http://www.arc-space.com/architects/zumthor/brother_claus/brother_claus.html

BCSSA Organization. Metamorphic Rock (photograph). Classifying Rocks and Minerals. http://www.bcssa.org/newsroom/scholarships/great8sci/Earth/RocksMinerals/Classifying_Rocks_Minerals.html

CAMIR. 2004. Canadian Mining Industry Research Organization. http://www.camiro.org/mining_products.htm

Canada Bodhi Dharma Society. 2007. Experiencing the World_A Message from the President. http://www.dharma.org.tw/en/1_AboutUs/PresidentDesk.html

Canada Bodhi Dharma Society. Outdoor Meditation (photograph). Meditation Class. <http://www.dharma.org.tw/en/Album05/index.html>

Canadian Mining industry Research Organization. Controlled Foam injection (photograph). http://www.camiro.org/mining_products.htm

Choyce, Lesley. 2008. *Peggy's Cove-The Amazing History of a Coastal Village*. Lawrencetown Beach, NS: Pottersfield Press.

Deketh H. J. R. 1995. *Wear of Rock Cutting Tools_Laboratory Experiments on the Abrasivity of Roc.*, A.A. Balkema, Rotterdam.

Discoe, Paul., and Quinn, Alexandra,. 2008. *ZEN Architecture_the Building Process as Practice*. Gibbs Smith.

Flickr Organization. A little Peggy for Nancy (photograph). <http://www.flickr.com/photos/topper1/5382716548/>

Flickr Organization. Pictou Landing Health Centre (photograph). <http://www.flickr.com/photos/swvander22/420715948/>

Flickr Organization. Kid Meditating (photograph). <http://www.flickr.com/photos/travelmeasia/5449494208/>

Flickr Organization. Walking Monk (photograph). <http://www.flickr.com/photos/l-michael-roberts/2565693708/>

Flickr Organization. Zen Rock Garden (photograph). <http://www.flickr.com/photos/notoriousjen/5093752452/>

Hawley, J. Bradey. 2003. Modular On-Site Wastewater Treatment Systems Using Natural Peat Moss. From <http://www.shawpipe.com/Resources/Docs/ShawPeatTechnical-Manual.pdf>

Health and Yoga. 2006. Meditation... Towards a Stress Free Life. <http://www.health-and-yoga.com/html/meditation.html>

Heartwood Centre Community. Yaga Meditation (photograph). <http://www.heartwood-center.com/classes2.html>

Lyons, Brian Mackay. 2008. *Ghost-Building an Architectural Vision*. New York: Princeton Architecture Press.

McHarg, Ian L. 1992. *Design with Nature*. New York: John Wiley & Sons, Inc.

Ministry of Environment. Environment Protection (photograph). http://www.env.gov.bc.ca/wat/wq/nps/NPS_Pollution/Onsite_Sewage_Systems2/Onsite_Main.htm

Mt Meru Pte Organization. Japanese Bamboo Charcoal (photograph). Microstructure. <http://www.mtmeru.com/bamboo-charcoal/about-bamboo-charcoal.html>

NEO2 Blog. Martin Puryear (photograph). <http://www.neo2.es/blog/2008/10/martin-puryear-el-escultor-negro/>

Picasa Blog. Detail of bentwood truss (photograph). http://picasaweb.google.com/lh/photo/4MT_Egfk2hi8J-lxtLEBGg

Rosmana A. P. 2009. The Formation of Continents and Oceans. <http://rosmana.blogspot.com/2009/07/formation-of-continents-and-oceans.html>

RST organization. The Science of Geology (photograph). *Sedimentary Rock*. http://rst.gsfc.nasa.gov/Sect2/Sect2_1a.html

Sampson, Anita M., Donohoe, Howard and Martha Devaney. 1987. *A Walking Tour of Rocks, Minerals And Landforms of Peggys Cove*. Halifax, NS: Department of Mines and Energy.

Shaw Company. Shaw Peat Gallery (photograph). http://www.shawpipe.com/peat_gallery.aspx

Swick, David. 1996. *Thunder and Ocean-Shambahala & Buddhisim in Nova Scotia*. Lawrencetown Beach, NS: Pottersfield Press.

Trungpa, Chogyam. 1991. *The Heart of the Buddha*. Boston & London: Shambhala Publications, Inc.

Williams, Graham L. 2001. *The last Billion years_ A Geological History of the Maritime Provinces of Canada*. NIMBUS Publishing.

World Architecture Organization. E-architect (photograph). Pictou Landing Health Centre. http://www.e-architect.co.uk/canada/pictou_landing_health_centre.htm

Young, Chapman. 1999. *Controlled-foam injection for hard rock excavation*. Steamboat Springs: Geodynamics Inc.

Zumthor, Peter. 1997. "A Way of Looking at Things," *Thinking Architecture*, Basel: Birkhauser.