JAPANESE ROCK GARDEN

YING ZHANG | SENIOR INTEGRATIVE EXERCISE | DECEMBER 11, 2017

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Japanese Rock Garden

かれ山水

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Introduction

The project is based on the Off-Campus Program in Kyoto, Japan. For this Comps project, I designed and created a Japanese Garden in Carleton, MN in order to explore the relationship between geology and its real application in Japanese Garden. In the aspect of design, I applied the traditional Japanese garden building principles and also incorporated the idea of Minnesota’s local landscape that has been shaped by glaciation events. In terms of materials, I used the rocks that are representative of Minnesota’s geology, and plants that are suitable to the local climate.
In the first known manual of Japanese gardening, the Sakuteiki, "Creating a garden" is expressed as "the art of setting rocks" in Japanese. Selection of rock types, the combination of different rocks, ways of setting rocks are all important parts of the art of setting rocks. Therefore, rocks play an important role in the traditional Japanese garden and the importance placed on rocks in Japan stems from several sources.

The first one is from the tradition of using rocks as a sacred representation of gods as prayer sites. The most appreciated sacred rocks, called "iwakura," are found naturally in the landscape, often with a rounded form or a naturally upright appearance. The sacredness of rocks is lying in the belief that through the medium of the rock, gods could be induced to descend to visit earth and bestow their blessings.

In later eras, the use of rocks in gardens incorporated the spiritual qualities inherent in sacred stones. There were new meanings added to these garden rocks, such as meanings that were derived from cultural imports of Buddhism and geomancy (a traditional Chinese method of geophysical divination). Stemming from these influences and as stated in Sakuteiku, "stones are imperative when making a garden," stones are essentially regarded as a requisite part of gardening. (Takei and Keane, 2008)
The selection and placement of rocks are the most important parts of making a Japanese rock garden. For the general rule of setting rocks in Sakuteiki, it is suggested to set stones upright. Moreover, there are more very specific rules for choice and the placement of rocks. Rocks come in all manner of forms, shapes, and sizes. In Japanese gardening, there are different classifications of rocks: tall vertical, low vertical, arching, reclining, or flat. Different shapes of rocks are usually applied to represent different scenes. For example, when creating "mountains", it is common to use igneous volcanic rocks because igneous rocks usually have sharp edges, suggesting rugged mountain shapes. Smooth, rounded sedimentary rocks are normally used for the borders of gravel "rivers" or "seashores." In terms of rock combinations, individual rock rarely plays the major role. The emphasis is placed on the harmony of the rock composition.

It is noticeable that rocks in a Japanese garden are rarely if ever placed in straight lines or in symmetrical patterns. The most common arrangement is one or more groups of rocks. There is one most common triad arrangement that has a tall vertical rock flanked by two smaller rocks on sides, representing Buddha and his two attendants. In my project, I chose this triad "Buddha and attendants" arrangement as the major rock scene in the garden since it is a classic composition.

When placing the rocks, it is supposed to place them in the same position in which they were created. However, there are several exceptions; for example, if the stone had tumbled off the mountain due to the effects of erosion or perhaps an earthquake and the rocks had weathered and settled into its new environment during a long period of time, then the new position is acceptable. We could see that the way of setting rocks is closely related to ancient Japanese observation and respect of nature. (Takei et al., 2008)
Igneous Rock Classification

Minnesota's Bedrock Distribution Map

Graph adapted from Exploring Geology, 2013, p. 113
Phaneritic Coarse Grained Felsic Granite
HOW DO IGNEOUS ROCKS (GRANITE AND BASALT) FORM?

When magma reaches the surface and erupts as lava, any igneous rock that forms on the surface is called an extrusive rock (volcanic rock.)
Basalt is one of the common extrusive rocks formed from the rapid cooling of basaltic lava exposed at or very near the surface of the earth. In fact, it is the most common volcanic rock type on Earth. It is aphanitic (fine-grained) and has generally 45-55% silica, less than 10% feldspathoid, and at least 65% of the rock is feldspar in the form of plagioclase.

When in some cases at a considerable depth (more than several kilometers), magma accumulate to form a magma chamber and solidify in this chamber instead of keeping going up reaching the surface, it solidifies as a plutonic rock, and the body of rock that forms is called a pluton. Granite is a very common plutonic (intrusive) rock and forms granitic plutons. In terms of texture, it is felsic (normally in a lighter color) and has coarse grains. It is nearly always massive, hard and tough, and therefore it has long been widely used throughout human history as a construction stone. (Reynolds, Johnson and Morin, 2013)
Most marble forms at convergent plate boundaries where large areas of Earth’s crust are exposed to regional metamorphism. Some marble also forms by contact metamorphism when a hot magma body heats adjacent limestone or dolostone. Marble is a metamorphic rock that forms when limestone is subjected to metamorphism accompanied by heat and pressure change. The major component is the mineral calcite (CaCO3), which under the conditions of metamorphism recrystallizes to form a rock that is a mass of interlocking calcite crystals. The marble used in the garden is composed of nearly 100% calcite and formed under higher grade metamorphism, which allowed calcite crystals grow coarser to produce a coarsely crystalline marble. That’s why it has the pure white color.
Kare Sansui, Japanese dry garden, as its named implies, is a style of garden that includes no water in its design. It could also be called as Japanese rock garden, which implies that it has a lot of relationship with rocks and in fact. It is a style of garden that is mainly composed of rocks and plants.
Typically, a dry garden is usually relatively small, surrounded by walls, and is meant to be seen from a single viewpoint outside the garden, such as the residence of the chief monk of the temple. Classical Japanese dry gardens were created at temples of Zen Buddhism in Kyoto during the Muromachi period. The scenery of the garden was intended to imitate the intimate essence of nature in order to serve as an aid to meditation about the true meaning of life.
“Select several places within the property according to the shape of the land and the ponds, and create a subtle atmosphere, reflecting again and again on one’s memories of wild nature”
— Sakuteiki, I. The Basics (Takei et al., 2008, p.151)

Paying keen attention to the intricacies of nature is one of the underlying themes in the Sakuteiki, the importance of which is made evident throughout the text but nowhere more clearly than in the opening lines above. It is important to note that the garden is created to be a miniature rather than a recreation of nature because the gardens were not designed to be nature parks or botanical garden where nature is re-created in full, but rather as works of art that extract certain aesthetic essences from nature. This need for distillation when designing an artificial landscape was also stressed in the opening of the Sakuteiki: “Visualize the famous landscapes of our country and come to understand their most interesting points. Re-create the essence of those scenes in the garden, but do so interpretatively, not strictly.” (Takei et al., 2008)
Comparing the two photos above (one about the real scenery in Japan and one about Ryoanji, a famous dry garden in Japan), we could feel that the Japanese dry garden could certainly be described as the miniature of nature.

Actually, in Sakuteiki, the nature is expressed as senzui, which means “mountain-water” which is part of natural constitution.

Senzui, which in later years would be pronounced sansei, has various meanings and usages. The most direct meaning refers simply to mountains and water. Moreover, it can also imply a landscape that contains mountains and water. This usage could be traced back to the popular theme of Chinese Song dynasty paintings of natural landscapes depicting mountains and rivers or mountains and the sea.

Out of the vastness of nature, mountains and water have been chosen as representative elements. It is believed that fusing them into a single icon could represent the whole. According to Chinese geomantic thought, rigid and stable mountains are considered to be Yang elements, while fluid and ever-changing water is Yin. Therefore, we see that mountains and water were chosen not only for their ubiquitousness in landscape and its common depiction in Chinese paintings but these words also represent what was perceived as the two most fundamental building blocks of the natural world. (Takei et al., 2008)
As the stressed in the Sakuteiki, a garden is created to be a work of art that extract a certain aesthetic essence from nature. Keeping this principle mind and tracing back Minnesota's geologic history and thinking about its characteristic glacial landscape as being called as "land of 10,000 lakes," (There are 11,842 lakes in precise) I decided to recreate the essence of MN's lake scene in the garden. When choosing the lake that I am going to represent, I decided to capture the feature of Lyman lake at Carleton College because of the great familiarity I have with the Lyman lake and the beautiful scenery in different seasons.
Most of Minnesota has been influenced by the glacial events repeatedly during the Pleistocene, which is also called “Great Ice Age,” when nearly all of MN was covered by glacial ice. It was only about 10,000 years ago, did the most recent ice-sheets started to retreat. The continental glacier left marks on the surface and vastly altered features of Minnesota’s topography and finally massively influenced the state's landscape.

Among these features, the most significant change was probably in the character and extent of the drainage. The glaciers scoured out the great concentration of lakes in northeastern Minnesota's Superior Upland and farther south created many kettle lakes formed by the melting of discrete blocks of ice.
Although in the last two million years, Minnesota had been sculpted by a series of glaciation events, these previous events have been largely covered by the most recent Wisconsin glaciation, which happened over the last 75,000 years. The Wisconsin glaciation more directly shaped the current landscape of Minnesota by carving the land and melting of ice. The Wisconsin glaciation has brought four prominent ice lobes into the state from the Laurentide Ice Sheet of Canada. Early glacial advances of Wisconsin glaciation came from three of the four lobes that dominated Minnesota glaciations: The Wadena, Rainy, and Superior lobes. (Morey and Dahlberg, 1995)

During the late Wisconsin glaciation, the Des Moines Lobe was the dominant lobe, with the Superior, Rainy, and Wadena lobes having much weaker advances, leading to the majority of Minnesota covered by the glacial till of the Des Moines Lobe. The Des Moines lobe is probably one of the most studied and understood lobes from the Wisconsin glaciation since its glacial sediment is found near the surface of most of the state. The Des Moines lobe reached its maximum position in present day Des Moines, Iowa about 14,000 years ago. The ice at its maximum covered about 75% of the state. (Morey et al., 1995)
During Pleistocene, glacial ice flowed from an ice sheet that covered much of Canada to the South into MN. In the area called ice domes or ice centers that is cold, with heavy precipitation, glacial ice was normally much thicker. In response to the pressure and gravity on thick masses of ice, ice in the domes flowed in the direction away from the ice centers. (Krippner, 2011)

As the climate changed, the ice in the domes changed strength over time. Therefore, as the ice lobes flowed south with changing masses and flowing velocities, they battled one another for space. Eventually, when a milder climate and other factors reduced the thickness of glacial ice, a lobe ceased to flow and stagnated and ultimately melted back to a more northern location. Places where the ice stopped and stagnated finally melted into numerous small lakes and swamps and are marked by end moraines or complicated landforms with a rugged topography.
'Shakkei' is the Japanese term meaning borrowed scenery and it is commonly used in a Japanese garden as a part of the integral composition. When choosing the site and designing the view of the garden, the original scenery of the site could be incorporated into the garden as part of the scenery or the background scenery, which further adds the natural sense to the garden.

For the garden that I created, I chose the site near the arboretum, where there is the woods area behind as the borrowed scenery and the green trees and shrubs in behind spatially increase the depth of the garden and blends perfectly into the garden. The Japanese garden is composed of carefully structured views. The carefully selected view was meant to be appreciated like a traditional Chinese Sansui (Mountain and Water) painting. As such views normally require a framing device, for example by means of architectural elements such as frame posts, garden walls, or hedges and so on. The framing device is a way of limiting the borrowed scenery to the desirable elements, thereby concentrating the impact in terms of the composition of the garden.
"Regarding the placement of stones there are many taboos. If so much as one of these taboos is violated, the master of the household will fall ill and eventually die, and his land will fall into desolation and become the abode of devils."

—Sakuteiki, X. Taboos (Takei et al., 2008)

The author of the Sakuteiki begins his instructions on taboos with these harsh words. The choice or placement of stones are the most discussed subject of the taboos mentioned in the Sakuteiki. When constructing the garden, I kept most of the taboo in mind in order to follow the old tradition as precise as possible.

- "Do not set a white stone that is bigger than those around it in the easterly direction or harm will come to the master of the house. Likewise, in all other directions, be careful not to set stones that are of "controlling" colors nor ones that are larger than the other stones there." (Takei et al., p.187)
- "If there are "running away" stones there must be "chasing" stones. If there are "leaning" stones, there must be "supporting" stones." (Takei, 2008, p.183)
- "Make sure that all the stones, right down to the front of the arrangement, are placed with their best sides showing." (Takei et al., p.186)
- "Regarding the use of famous landscape as models for gardening, if a landscape is in ruins, then it should not be used. Reproducing such a desolate place in front of a home would lea to all sorts of troubles." (Takei et al., p.188)
- "Taking a flat stone that once was reclining and standing it upright to face toward the residence. Whether it is set in a high or low place, far or near, it will make no difference. This will result in a curse." (Takei et al., p.186)
- "Using a stone that once stood upright in a reclining manner or using a reclining stone as a standing stone. If this is done, that stone will definitely become a phantom stone and be cursed." (Takei et al., p.183)
- "There should always be more horizontal than vertical stones." (Takei, 2008, p.188)
- "To make a garden by studying nature exclusibely, without any knowledge of various taboos, is reckless." (Takei et al., p.192)
The first thing of the project is to draw the plan view and perspectives of the garden. There are only three major components of the garden: the plants, rocks, and sands. Generally, the arrangement of these elements was based on the Japanese garden building history, consideration of local landscape and personal aesthetic taste.

The plants on both sides represent the forests on both sides of the Lyman Lake. The middle triad rocks composition represents the island in the Lyman lake, and the rest of the white sand area represents the lake water. The additional two rocks are added for a balance of visual purpose.
David Slawson

David Slawson, one of America’s most highly regarded landscape artists trained in the Japanese garden tradition, is also the one who created the Carleton’s Japanese Garden. In his design philosophy, he aims to create landscape gardens that evoke the beauty of the natural. The inspiration that I took from his work is his creation of the Japanese garden that represents the Great Lakes near MN, which motivated me to think about the relationship between the local natural landscape and the creation of the garden.

Shunmyō Masuno

Being called "Japan’s leading garden designer," Shunmyo Masuno has designed dozens of gardens throughout Japan and around the world. I was greatly inspired by reading his work "Zen Gardens: The world of Shunmyō Masuno," and seeing his design drawings, which gave me a new perspective and understanding of Japanese gardens.

Mirei Shigemori

Mirei Shigemori was a notable modern Japanese landscape architect and historian of Japanese gardens. He actively participated in many areas of Japanese art and design. After visiting most of the Japanese garden in Japan and recording every detail of those ancient gardens, Mirei Shigemori developed his own design philosophy. After visiting the Hojo garden in Tofukuji in Kyoto, which is a great work created by him, I tried to imitate part of the garden into my project.
David Slawson’s design plan for Carleton Japanese Garden. Graph adapted from Carleton Japanese Garden.

Perspective drawing of Shunmyō Masuno, graph adapted from Zen gardens: the complete works of Shunmyo Masuno, Japan’s leading garden designer. (Locher, 2012)

Hojo garden in Tofukuji, Mirei Shigemori

Perspective drawing of Shunmyō Masuno, graph adapted from Zen gardens: the complete works of Shunmyo Masuno, Japan’s leading garden designer. (Locher, 2012)
### Budget Usage

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<td>Moving Rocks</td>
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<tr>
<td>White Marbles</td>
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</tbody>
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#### Pie Chart

- **Soil**: 32%
- **Juniper**: 16%
- **Moving Rocks**: 39%
- **White Marbles**: 13%

**SHOPPING**

01 SHOPPING

Implementation

実装
The site is located near Farm House of Carleton College and it is on the edge of the Arb. The size of the site is 15 ft x 20 ft (as marked in the photo by the tape measure).

All the tools needed are shown in the picture: one tape measure, one spade, one rake, one garden hoe, and seven flags.
The first step is to create two small mounds on two sides (as shown in the perspective) and cover the mounds with plants. The design was inspired by the garden in Tofukuji created by Mirei Shigemori, which represented the five famous mountains in Kyoto. The reason that this was the first step was that it was better to plant earlier than later in the fall. The right side mound is 2.6 ft high and the left side mound is 1.3 ft. The two mounds are in different height in order to create a sense of asymmetry. The higher mound on the right side balance the inclination of the main rock in the middle and form a triangular composition.
After the soil was piled up, I had to decide the plant types. By researching for the locally available plants and the plants that were used in the Carleton Japanese garden created by David Lawson, I decided to use Japanese garden juniper, which is an evergreen shrub that is not only visually appealing but also easy to grow under Minnesota's local climate. In addition, deer, which normally eat shrubs in the Arb don't eat this kind of shrub.

Features of Japanese garden juniper:

Japanese garden Juniper is a dense mound of ground-hugging branches that radiate from the center. This feature allows the plant to spread and completely cover the mound. The new growth is bright green turning to bluish green as it matures. It has a color of purple tint when winter comes.

Light Needs: Partial to full sun
Watering Needs: Once established, it needs occasional water
Average Landscape Size: Reaches 1 ft. tall, 6 ft. wide when grown in natural form.
Key Feature: Easy Care Plant
Blooms: Conifer; prized for foliage.
The available rocks for the garden are located near the site. All rocks are provided by Geology department and are local Minnesota rocks.

When choosing the suitable rocks, I used the taboo of Sakuteiki as the reference. The major rock was the hardest one to pick not only because there were not many larger rocks but also because there were some restrictions on the major rock such as shape and color. I picked one big rock that is big enough with 3.6 ft in height, which perfectly matches the general height of the garden and has a generally satisfying shape and dark color. The rest of the rocks are picked based on the standards that the color and the shape of these rocks had to match with the major rock.
When moving rocks, it is important to keep the rocks intact from scratches, which might damage the appearance of the rocks and affect the view of the whole garden.

Also, when setting the rocks, checking the position and direction of rocks are quite intricate tasks, since a slight change of the position or the facing direction of the rocks could possibly change the overall garden.
Maintenance is also an important part of Japanese Gardens and the tasks include mainly cleaning the falling leaves, shaping the shrubs and raking patterns.
Acknowledgment

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First, I would like to thank Clint Cowan who serve as my senior comprehensive project advisor, and Kathleen Ryor who was my off-campus study program professor and also my external senior comprehensive project. Both professors inspired me to start working on this project and helped me a lot in my design and building processes. In addition, they devoted a lot of time in helping me get the permission of using the land to build the garden.

Next, I would want to say thanks to the Technical Director in Geology, Jonathon Cooper, who helped me a lot of getting supplies.

Also, I am grateful that the facility department, especially Jay Stadler and Bill gave me a lot of support and helped me move all those big rocks.

Finally, I want to say thanks to all geology department faculty, who attended my talk and gave me a lot of precious advice and my friends who helped me with those labor work and documentation during the term.

Reference

Carleton’s Japanese Garden Carleton’s Japanese Garden


