Exploration of material, light, and shadow

THESIS

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Abstract

The exploration of materials, light, and shadow, as well as the process of composing form in space are described in this thesis. My works are created by focusing on the inherent qualities in different materials. I consider the making process more valuable than the individual finished works. My understanding of materials deepens through visual and tactile ‘conversations’ during the production and postproduction process and allows me to transform materials while maintaining their unique qualities. My main goal for the final thesis was to create work that connects with viewers in a sensory relationship.
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Chapter 1: Introduction

The world is getting smaller due in large part to the advancement of new technologies. The Internet enables me to connect to the world, get live information from the other side of the world, and communicate with people all over the world. Websites such as Youtube can reveal the uniqueness of each culture and highlight how different we are from each other. However, the motivation for my thesis project is based on cross-cultural experiences gained from my various stays in different eastern and western countries. As I experienced different cultures, I also started to seek myself. I realized that I needed to develop a neutral state of being, a way of being that stayed with me no matter what country I was living in. Eventually, this need for equilibrium inside myself began to be reflected in my work. I began seeking a fundamental or universal language of form in material.

Before I started to study art, I worked as a project training coordinator for the Japan International Cooperation Agency. The projects were centered around the principles of nation building in developing countries. In this position, I worked with trainees from more than one hundred developing countries and my interest to work on-site abroad started to grow. I started nurturing a desire to develop the visual and artistic tools necessary to aid me in various education projects in different countries. However, I never had formal artistic training in Japan. As a first step, I decided to go back to college and study art in the United States to gain skills in both English and art. I was accepted at
a community college in Seattle, Washington. The art foundations I learned in the west became the guiding principles of my art making process, in particular the use of the Golden Mean served as the primary foundation to my pursuits. My education continued at Alfred University, New York, where I studied ceramics and glass art. These process-oriented mediums enabled me to explore different kinds of materials, building techniques, and various kiln firing processes.

Returning to Japan, I received the opportunity to work as a resident artist at the Shigaraki Ceramic Cultural Park at the small town called Shigaraki near Kyoto, Japan. Shigaraki is well known for its clay bed and anagama wood fired ware. While in residence, I was immersed in an environment surrounded by traditional potteries and ceramic artists. The experience in Shigaraki stimulated my desire to explore my relationship to materials and the perception of interior space as influenced from my native culture.

Later while living within the Scandinavian aesthetics as part of my everyday life, I recognized that there were also different ways to change lives and provide a method to enhance one’s well being. I investigated these idea while in residence at the international ceramic research center in Denmark, and through my studies in the Applied Art and Design program at the University of Art and Design Helsinki, Finland. New opportunities opened up for my works through several design projects such as producing a small-sized, freestanding kitchen component as well as designing tableware to fit with the component. I started to think about more than material and singular objects and began to think about the total work of art, the space surrounding objects, and the atmosphere it creates.
My exploration of material, and my desire to seek a universal language of form in material continued at the Ohio State University. While pursuing my MFA degree at OSU, I created the Deko Boko series and the Paper Sculpture project by reflecting on my cross cultural experience and studies in different countries. To enhance my familiarity with new technologies and local materials in Ohio, I experimented with different kinds of materials for each project. Moreover, the working experience as the gallery assistant at the Hopkins Hall Gallery enhanced my knowledge of spatial relationships and the role of light.

Those initial projects and working experiences became the stepping stones for my final thesis project and further extended my desire to continue the studio practice. For the final thesis exhibition at the Ohio State University Urban Arts Space in Columbus, Ohio, my work was the culmination of my explorations with material, space, light and shadow.
Chapter 2: Concept

My cultural background influenced my relationship to materials. Japan, where the old tradition and advanced high technology coexist, nurtured my sense of materials, a flexible attitude towards the changes within my surrounding environment, and my curiosity toward old and new things. Because the early Japanese believed that all things in nature had spirits and were spiritually connected, they were especially attuned to the appearance, character, and life of natural things (De Mente, 2006). This respect for nature became a central core of my belief system and the reason I have been so intrigued by materials, specifically clay, within my art endeavors. For me, clay was one of the most difficult materials to use because of its plasticity and instability in the making process, as well as the unpredictable nature of the wood firing processes. However, ceramics was one of the most familiar materials to me for its frequent use in Japanese daily life. The table manner, such as a holding the rice bowl, while having a meal or sipping a soup directly from a bowl, enhanced my tactile experience with the material itself. My use of materials such as clay, wood, and paper is related to the Japanese aesthetics of impermanence and the ephemeral. This aesthetic was visible in traditional Japanese houses, for instance in sliding doors, paper panels are used and renewed each year. In addition, the structural aspects of the traditional Japanese house influenced my goal to design space in connection with my art works.

My perception of architectural space, where there is no sense of division between
inside and outside, was nurtured through my childhood experience in various Japanese houses. The kindergarten I attended was run by a Buddhist priest, so I spent time at a traditional Buddhist temple. This temple was constructed of impermanent materials—wood for structure and paper for the sliding screens. The traditional Japanese building style does not have windows or interior walls; only wooden pillars and beams creating free open interior space. Removable sliding wood and paper panels are used as temporal walls, depending on climate and occasions. Although there are no physical walls, such as brick or stone walls, the wooden pillars often define psychological boundaries creating intimacy areas within the open space. The porch or veranda under an overhung-roof served not only as a play area for me, but also as a transitional space, “regarded as part of the building when viewed from the exterior, and as part of the outside world when viewed from within” (Wright, 1992, p.10). This notion of transitional space between inside and outside overlaps my dual identity that belongs in both eastern and western culture, and drives my exploration for a universal form of design.

Another influence from the Japanese traditional houses was their introduction of the modular system within building design. The Japanese traditional styled buildings used the tatami mat flooring. The tatami mat is made of sewn igusa straw, each mat measuring approximately 3 feet by 6 feet. The traditional temple that I attended in my childhood was floored with these rectangular shapes and tatami mats have since served to inform and define my notion of modular systems and spacing with geometric shapes. Through my daily activities, playing with friends or taking a nap on tatami mat floor, I could physically memorize the standard size of a singular tatami mat and the combinations that
the mats could make. Traditionally, Japanese use the unit called “jou” to measure the size of a room. The character of “jou” means tatami mat. The standard room size in a private house is six “jou” which means the room can be fit with six tatami mats. This unit “jou” is still used today, even for the contemporary designed rooms without tatami mat flooring. The main reason is that “jou” allows people to visualize the size of rooms more easily instead of having to know the exact size in metric system. The Japanese perception of space based on the “jou” grid modular system has been demonstrated frequently in my works.

The experience of light and shadow in traditional Japanese houses also became a major inspiration of my work. Inside the traditional houses, “shoji,” which is the removable paper sliding door consisting of translucent paper over a lattice wooden frame, is installed between pillars. During the daytime, shoji filters through about 50% of direct sunlight, and the softened sunlight illuminates the entire space without creating strong contrasts. In addition, a dapple effect from over the lattice frame creates ephemeral shadow images. At nighttime, shoji becomes a part of the walls, reflecting 50–60% of interior lighting. When looking from the outside, shadows cast by interior room lights over the shoji create an effect almost like sumi brush paintings. Working as a gallery assistant at OSU, installing the various lighting needs, I reconnected to memories of shoji. Understanding the significance of light and shadow and how light and shadow can affect the appearance and atmosphere of space, I discovered ways to interact with art works and influence the overall experience or tone of space.
Chapter 3: Research

Material

The main source for my design conceptualization for the final thesis work began with the possibility of working with new materials. I had been using natural and impermanent materials for my art work, but many interesting new materials invented by industry had begun to interest me. For example, in Finland, I had produced a washbasin and a kitchen component in collaboration with Durat, the design product company that had invented a new plastic material. This material, made of 30% recycled plastics, was also 100% recyclable. My thesis research explored traditional and new, impermanent and permanent, organic and artificial materials. Through my works, I wanted to find a balance between these dualities and use them to create new space.

The traditional, familiar materials that I explored were paper, wood, and porcelain. The new, unfamiliar materials I was interested in were plastic-based and had translucent properties. Moreover, those new plastic materials, including Plexiglas, Acrylic, DuPont Corian, and LG Hi-Macs, could be curved directly by Computer Numerically Controlled milling (CNC) to obtain the ideal form.

Compared to porcelain, which is a rather difficult material to handle in terms of the production process required to obtain sufficient translucency, these new materials were quite simple. However, as Lacey noted, ceramics could “transcend the fast moving home-ware trends and remain loved and relevant over extended time” (Lacey, 2009,
I believed that ceramics was one of the materials that could convey the sense of human touch, both visually and tactilely.

The question I was confronting was what kind of ceramic material could be appropriate for obtaining the sufficient translucent quality and durability, yet maintain the hand made quality, and be adaptable as an element in creating defined space.

I started to test different types of clays. I began with white stoneware slip from my previous Deko Boko sculpture project. The material quality of this white stoneware slip was quite stable and also displayed a creamy white color on the surface after firing that resembled a handmade paper surface. The test pieces made with the white stoneware presented some translucency, however, as I increased the scale of the work the open cell structure was not stable.

Figure 1. Deko Boko – ceramic sculpture
Next, I tested a porcelain body, which, in simple terms, consisted of five parts of clay, three parts of feldspar, and two parts of silica. To withstand the firing process, each portion needed to be adjusted to figure out the right amount. Another solution to increase the strength of porcelain was to add 0.3-0.5% of paper or nylon fibers with the porcelain. I tested different kinds of porcelain slip to compare the color, translucency, durability, texture, and firing stability. Although porcelain could obtain the translucency, there were many deficiencies resulting from the making and firing process. Such as, in the case of commercially produced lithophane, the translucent porcelain lighting products, about 40% of losses were expected during the production process of demolding, drying, and firing.

After several testing, I selected a mid-firing range, white porcelain slip produced by the Columbus Clay Company. Compared with regular porcelain that required temperatures over 2,300°F, this lower temperature caused less stress on the work.

Shifting my thinking process, or thinking the opposite, provided me with an unexpected direction towards new ideas. One of the ideas was directly combining old and new, familiar and unfamiliar materials. Similar products have been produced in industry for different purposes, such as a catalytic converter for cleaning exhaust air and a ceramic foam filter for cast iron filtration. These “ceramic forms are typically formed by saturating polymer foam (or similar porous material) with ceramic slurry. The firing process hardens the ceramic and simultaneously burns out the foam” (Thompson, 2007, p.487). At first, I was not sure what kind of open cell structure material would be appropriate. I started searching everywhere, from pet shops to school dumpsters.
Eventually, I collected the following materials: burlap, anti-bird netting, a mattress, polymer foams such as a synthetic filter cartridge for aquarium, a synthetic air filter cartridge, an audio speaker cover, and so on. These items consisted of open cell structures that had potential to transform into something new.

![Figure 2. Synthetic Foams](image)

**Slip Application**

I experimented with several kinds of slip applications, each of which affected the results of the post-fired translucency, texture, pattern, and durability of the test piece. For the first experiment, I poured the porcelain slip over the plastic materials following the general slip casting process. The firing tests resulted in obtaining the sufficient translucency, stability was also achieved in terms of maintaining the objects original
lattice structures at a high firing temperature. However, getting an even coat over the open cell structure was very difficult and wasted large amounts of slip.

Next, I tried slip-trailing, a great technique for creating patterns and textures similar to a paint brush stroke on the surface. The slip-trailing was very efficient as a surface treatment, and also made a spider web-like structure that increased the durability by providing an additional structure.

I also tried immersing some of the synthetic materials directly into a container filled with porcelain slip. This method seemed unrefined, but it was the most systematic procedure for distributing the porcelain slip evenly into the open cell structure. The excess amount of slip was simply squeezed out by hand and reused again for the next application.

An advantage of slip coating synthetic foams is that they can be fired in a kiln immediately without drying completely. Very minimal cracking or warping occurs during the drying process. Compared with the standard slip casting process which takes a couple of days in general, introducing this material and process can save the time and labor for drying and firing. Similarly, application of the slips was very simple, because it was easily absorbed in between the open cell structure of synthetic foams.

The method of coating existing materials with slip could potentially reduce the number of deficiencies that typically occur during the drying and firing stages. Moreover, the possibility of adapting this process to industry exists because the method did not require highly trained or experienced workers.
Firing

The final determining factor in the shape, size and appearance of the works was the firing process. For the first small-sized test pieces, I started to use the electric kiln. I discovered that some small test pieces could survive a single, fast firing; however, if larger than 1.5” in height, the open cell structure could not withstand its own weight or the stress from the high temperature atmosphere in the kiln. I also discovered that to obtain an adequate amount of strength, the piece needed to be about one half to one inch in thickness.

Firing small amounts of synthetic foam did not emit much fumes inside the facilities. However, as the size and number of pieces increased, the vaporous exhalation from the plastics became more problematic. Since most electric kilns at OSU are not connected directly to the ventilation system, firing in the well-ventilated gas kilns was the alternative choice to prevent the emission of fumes and to continue the firing experiment.

The dimensions of works were dictated by the size of kiln shelves and gas kilns available at the ceramics department’s facilities. The maximum horizontal dimension for the largest kiln was 4’ by 4’, using eight 2’ by 1’ kiln shelves. I experimented with firing synthetic foam from a dog bed dipped in stoneware slip, in the largest gas kiln. Unfortunately, the piece cracked and could not maintain its shape after being fired. Although the firing result was not successful, I learned what needed to be improved on from the failure. First, to prevent the cracks, more silica sand was required to spread underneath the work to allow the piece to move as it shrank. Second, the piece could not overhang any uneven kiln shelves. After several gas firing tests, I succeeded in firing a
24” by 24” size piece without having major cracks or distortion. Since the final work was aimed to provide the possibilities of a new material to be used as an element in interior space design, 24” by 24” was moderate.

Lighting

As important as the porcelain and plastic materials are to me, so is the lighting. The effects of lighting had the potential to completely change the appearance and the entire atmosphere of any space I wanted to make.

My gallery experience at OSU enhanced my knowledge about lighting and how to select suitable light sources for every art work and its surrounding. The Hopkins Hall Gallery used about eight types of light bulbs, which had different tonal qualities, brightness, and pattern as well as different kinds of filters. The Urban Arts Space, where the final thesis exhibition was held, used similar kinds of light bulbs for the exhibition. I became familiar with the different light bulbs, such as fluorescent, halogen spot and floods, halogen 25 & 30 degree angle, incandescent spots and floods, and began testing their effects on my pieces. I learned what qualities of light I preferred and how to achieve it. For example, simple but important, in terms of color, compared with a cool, blue light, I learned that I prefer a warm, yellow/white light that conveys an emotional ambience in space.
Chapter 4: Process

Tactile + Visual

My perception of material was nurtured through daily activity and experiences living in a traditional Japanese house. Thus, whenever I touch objects, I am trying to tactiley understand the visual information. On the contrary, when I see objects, I try to visually understand the tactile qualities. The ability to visualize a tactile sense, and to create a tactile sense visually, is a major component of my art making process.

Learning how to work with an abacus as a child influenced the development of my visual and tactile sense as well. The left side of our brain typically is used for logical thinking such as mathematical calculation. However, when calculating with an abacus, both the left and right sides of the brain are used simultaneously. Advanced abacus users are even capable of learning how to mentally calculate using only the right brain to imagine the abacus. The mental calculations enhance the user’s ability to receive visual and audio information directly into the right brain and to process the information visually, skipping all the numerical calculations. When I was trained in this type of mental calculation, my fingers were also moving, controlling the imagined abacus in my mind as if I were touching the real abacus. Through the training, my tactile sense and visual sense were connected very closely. I discovered that clay is an excellent medium for receiving tactile and visual information and constructing ideas into tangible form.

For instance, my previous Deko Boko tile project, made in Fall 2009, consisted of
two geometric patterns that the viewer could rotate, creating infinite patterns by adding more playfulness and enhancing the tactile qualities. Using the geometric shape was based on the idea of allowing interaction between form and individuals. Although ceramics is a permanent material, the Japanese notion of impermanence is also reflected in the relationships and patterns.

This notion of a grid modular system was also introduced to design the forms and to prepare for an installation in an unfamiliar exhibition space for my final thesis work. The advantage of a modular system was the flexibility to adjust the arrangements, in response to the installation space.

Figure 3. *Deko Boko* tile series
Visual and Actual Prototyping

While using clay to express my inspiration, I also began using computer-aided design for developing ideas. Computer-aided design is similar to my mental calculation experience, allowing me to assemble information and immediately visualize many unformed ideas. Moreover, various modeling functions, including the material features and lighting effects, enabled me to develop spatial ideas by arranging the models tactilely and visually. For example, my familiarity with computer-aided design allowed me to visualize infinite modular patterns in my previous tile project and in the *Deko Boko* modular sculpture series.

In my research, I continued to develop four virtual prototypes with the porcelain panels in mind using CAD. I created, for possible use in my final thesis work, a wall and ceiling mounted translucent tile system and spatial system using the tiles as partitions or as a “room within a room.”

In addition to the computer-aided design for prototyping, using physical prototypes was a great method for evaluating designs I had created on CAD. The actual
prototypes allowed me to explore how to light shapes in space, and how to maintain a shape against the laws of gravity.

For instance, I explored different hanging methods using monofilament, wire, and cable, using fragments of test pieces to create small spaces. I tried different light sources from both the front and rear of the porcelain test pieces. I learned that the thickness of the panel needed to be about ½-1 inch to allow adequate translucency – the same as was needed for firing and hanging strength.

To convey a similar sense to the transitional space of the Japanese paper sliding screens, I tested the pieces for vertical installation. I used monofilament for hanging the porcelain panels vertically in the air, so that people could walk around them freely without having any visual distraction from pedestals or shelves. Moreover, the transparent quality of monofilament did not create distracting shadows, and also provided a sense of weightlessness. The monofilament had enough strength to hold the weight of the porcelain panel. However, it was not secure enough for the kind of interaction I wanted viewers to have with the installation.

To increase the security and reliability for exhibiting such fragile material in a public space, the solution was to try a steel wire display system. This system was used for hanging sheet glass by fixing it with small metal clips and suspending it with steel wire from the ceiling to the floor. The samples that I received from two display companies were well designed for easy installation and reliable strength.

Since this display system was designed for store display mainly using flat smooth surface materials, there was a major problem in attaching the metal clips to the slightly
warped, fragile surface of the porcelain panels. Although the metal clips could be attached to the porcelain panel, there was a possibility that the tension from the extended steel wire might break the weakest point of the porcelain.

Another solution was to frame the porcelain panel with a light and durable material, such as wood or aluminum from which to hang. This frame would also increase the overall strength of the piece. The framing solution could also create a visual contrast between the geometric shape of the frame and the textured, organic porcelain surface. This solution also enabled me to fix the metal components for cable, avoiding the pinpoint pressure on the porcelain panels.

Another test trial was to discover how to install the panels for creating ceiling systems or rooms within rooms. However, it proved very difficult for the thin porcelain panels to hold their fragile structure when suspended horizontally. I began experimenting with support structures. The first mock up was made quickly by using found objects around the studio, such as an old pedestal and a glass shelf that also allowed me to light the panels. I installed both fluorescent and halogen lamps inside the pedestal, which was missing one side. I covered the pedestal’s hole with the sheet of glass and a porcelain panel. The porcelain panel was slightly larger than the sheet glass so that the panel covered the glass and only the light could come through from the bottom. I continued to develop the concept by changing materials, and the dimension of the light box on which to place more porcelain panels. I created a larger pedestal using acrylic instead of glass for the support, and installed the halogen and fluorescent lights. The problem was that the halogen light generated too much heat resulting in melting the acrylic surface right above
the bulbs. I continued to test other lights, such as LEDs that generated no heat, but were expensive and created a strong light pattern. I chose to use warm spectrum fluorescent light bulbs that generated little heat, created an even light and the yellowish color I liked. The panel’s surface, emphasized by light and shadow, reminded me of the forces of nature such as hot lava, and the solar prominence. I was also surprised to be reminded of a Japanese snow lantern. These lanterns, that we used to make when I was a child, are made of compact snow, similar in shape to an igloo and lit on the inside with a candle.

Figure 6. Lighting with halogen lamp
Final Solutions

For the thesis exhibition, I created two major pieces, *Untitled (Vertical)* and *Untitled (Horizontal)*, based on my research.

*Untitled (Vertical)*

For *Untitled (Vertical)*, I used a modular system which allowed me to adjust arrangements easily on site. However, my main goal with *Untitled (Vertical)* was in creating an installation that people could interpret and participate in, becoming part of creative process. Suspending the wooden framed porcelain panels in space, off the wall, allowed viewers to walk around the panels, enabling them to experience the different sides of the work and their relationship to space and volume. The viewers could interact with the pieces through the light and shadow created by the porcelain panels. The shadows from the work and the shadows made by the viewers created an ambience, much like the places of transition in a Japanese traditional house. Suspending the wooden framed porcelain panels in space, off the wall allowed viewers to walk around the panel, enabling them to experience the different sides of the work and their relationship to space and volume.

I used a halogen 25° flood directly on one surface of each panel. The light showed the organic texture and original white color of the porcelain. The other side, without direct light, showed a completely different appearance. The translucent effect of the porcelain was the same as the atmosphere of Japanese paper screens. If two viewers approached the piece from different sides, they were able to interact with the material and each other through the light and shadow effect that could be seen from the opposite side.
I was pleased that the effect of the panels and their shadows reflected the memory of my childhood experiences inside the traditional Japanese houses.

Figure 7. Untitled (Vertical)
Compared with the pre-exhibition planning for the final decisions for *Untitled (Vertical)*, *Untitled (Horizontal)* was made rather intuitively at the exhibition site. The high rate of failure in the firing had left many fragmented pieces of the porcelain panels in my studio. I decided to use these fragments for *Untitled (Horizontal)* by placing and composing them on the light box intuitively, based on my artistic sense and the surrounding ambience of the exhibition space. Unlike the single panel mock-up, *Untitled (Horizontal)* had multiple layers of fragments which became more like lava moving in the dark or a topographic map, and created an interesting tonality of shadow as well.

For *Untitled (Horizontal)*, I was interested in the unexpectedness happening during the process, which was similar to the wood firing process and the way I created my works in Japan. My works in Japan were more organic than those I had been making recently. In this final show, I was aiming for *Untitled (Horizontal)* to be more organic to create a balanced ambient space together with the formal qualities of *Untitled (Vertical)*. This thesis exhibition was the first time for me to create a space with works that were made combining these different approaches. This experiment opens up a new way of working and new ideas for my future works.

Figure 8. Installation at exhibition site
Figure 9. *Untitled (Horizontal)* – detail
Figure 10. *Untitled (Vertical)*
Figure 11. *Untitled (Vertical) & Untitled (Horizontal)*
Conclusion

*Untitled (Vertical)*, created with my more logical sense, using the left side of my brain, and *Untitled (Horizontal)*, which I made more intuitively by using the right side of my brain, were harmonized in the space by using light and shadow. The two pieces, made of traditional and new materials and processes, reflected my dual identity with the east and west.

Through the research and experimentation with materials, I now have the possibility of using this hybrid material for interior and architectural space. But the results revealed some problems that I must confront before further development. Although, I recycled tests fragments for *Untitled (Horizontal)*, ecological concerns are one of the issues that I need to reconsider and to solve. For the final thesis work I used synthetic materials with porcelain; however, finding an alternative material, to reduce the amount of vaporous exhalation from the synthetic materials, is crucial. In the design product market, Marcel Wanders, the Dutch interior designer, released the small porcelain flower vase from the design company Moooi in 2002. In terms of selection of material, the concept of Marcel Wanders to use natural sea-sponge for the flower vase was successful for its visual aesthetics and ecological concerns. One of the solutions to decrease the amount of gas from firing is to use a similar kind of organic material or open cell foams made from organic materials such as starch.

Finally, this written thesis was challenging for me especially in English. However,
the experience was valuable for me to learn how to explain my art works, and to enhance future connections with viewers as well as with my own actual art pieces.
References


