Lamps & Chairs

BFA Thesis for the University of Michigan School of Art & Design 2012

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Introduction

Our material world is the place where we become responsible for form, function, and the relationships implied by the consequent objects. By assuming the role of a designer, I have made it my prerogative to engage in this discussion through material studies in the form of lamps and chairs. These objects are an attempt to navigate the boundary between craft and technology, where digital fabrication processes aid, not overshadow, the hand of maker. Working under the parameters of digital tools can often lead to form language that is completely bond by the mechanics of the machining process, however by using the digital tools as a means to a beginning, as apposed to an end in itself, I create work that maintains a relatable, gestural quality. The aesthetic impact of my objects is derived through the details which are necessary for their creation--I want to achieve elegance through craftsmanship and refinement.

Part I: Lamps

I have a predisposition for making functional objects, which stems in part from my background in functional pottery. I find making objects to be most satisfying when people use them, and the object's success determined through interaction and how well it integrates into someone's life. The nature of throwing pots, where you only work from one side, pulling the clay walls up gradually until the form is achieved, was my foundation in considering form in (cross-) section--this is where I begin conceptually. After developing my skills making functional pottery for a few semesters I became interested in slip casting. As I saw it, slip casting offered me a way to create and replicate highly refined objects, and was a necessary step in becoming a well-rounded ceramicist.

In Fall of 2009 I was exposed to an experiment from the Architecture college where someone had attempted to create a translucent stoneware wall lamp from a two-part CNC (Computer Numeric Controlled) milled plaster mold, sanding down the form in its bisque ware stage to make it as thin as possible. While the bulbous form was successfully cast, the clay body was too opaque to transmit light, and the project was discarded. This work completely altered the way I thought about mold making; traditionally I would have had to make a perfectly refined positive form, and then cast a plaster mold from the positive. The use of the CNC mill to generate the mold negates that first step, thus saving time, but it also ensures that the mold can be geometrically perfect and that spheres can easily be cast in two-part molds with a single parting line, where traditionally it may have been wise to split it into three sections to ensure a proper release.

Consulting ceramic professors, I learned that while the stoneware body from the failed experiment would not be adequate for transmitting light, certain porcelain clay bodies when fired thin, and at a high enough temperature, do become translucent. Consequently, it became my charge to digitally design and fabricate a plaster slip cast mold for a lamp and cast it with a porcelain clay body thin enough to achieve translucency. This required me to become competent with Rhino 3D, CAD (Computer Aided Design) software that is used mainly to create geometry for digital fabrication processes, as well as RhinoCAM, which is a plugin for Rhino that is used to generate the machine code for the CNC router.

While the methods of fabrication that I have explored have been developed mostly in the last decade, the idea of making lamps from clay is not revolutionary by any standard. The earliest clay lamps from the Mycenaean civilization date back to 1500BC, which were made from a simple open dish and a floating wick (Fig. 1). This design was innovated upon by various civilizations up until the 4th century BC when the Romans improved the safety and functionality of the design by curving the lip to prevent spillage, adding a spout to accommodate the wick, and a handle to ease transportation. While these types of lamps are still used today in areas of the world that lack access to electricity, ceramic lamps with wicks began to diminish around the 15th century in favor of wax candles (O'Rorke 8).

Fig. 1- An oil lamp made of clay used for the diwali festival in India (Haryana). Courtesy Arne Hückelheim

Contemporary ceramic artists continue to explore the possibilities between the interplay of clay and light--Margaret O'Rorke's handbook, *Clay, Light, & Water* (Fig. 2), has been an indispensable resource for me, providing inspiration and justification for my mixed media exploration. Her book catalogues not only her own work, but projects from ceramicists from around the world who have incorporated light into their work, the consensus being that light can become fully integrated into a ceramic object, creating a more dynamic, lively object.

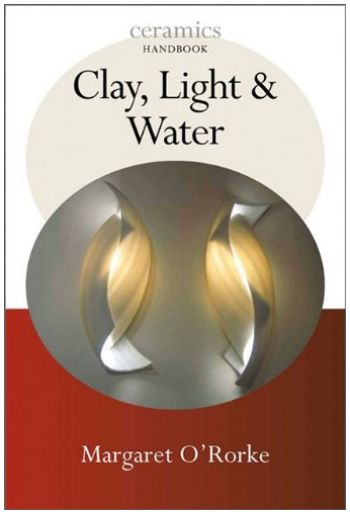

Fig. 2 - Two of O'Rorke's illuminated wall sculptures on the cover of her book

My material exploration in porcelain resulted in five different forms, three of which were displayed in their finished state at the exhibition.

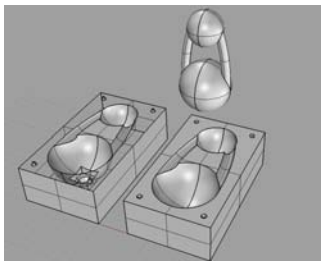
Fig. 3 - Rhino model of the mold and form for L1

When developing the form of L1 (Fig. 3,4), I wanted to expose the use of the digital fabrication through the use of spheres in an expression of geometric precision. At the same time I didn't want to completely abandon figurative elements, or make an object that was cold and mechanical. I see the large sphere hoisting the smaller one above it in a motherly sense, where the separate forms are relying on each other to remain complete. This humanistic quality is enhanced by the addition of the light, which cause the porcelain to glow warmly from the bottom upwards, in essence giving life to the object. It is intended to function as subtle ambient light, akin to a nightlight.


Fig. 4 - L1

L3 (Fig. 5) is a two-piece hanging lamp generated from two open molds. The open molds allow me to refine both the inside and outside of the two forms before they are fired, ensuring an even wall thickness free from fallback drips that are characteristic of slip-casting. This design takes cues from the hanging spun aluminum lamps of Poul Henningson (Fig. 6), where by a stacking shapes are used to direct the light. L3 is the largest lamp in my series, the top dome measuring 17 inches in diameter when fired. The modularity of this lamp has allowed ample space for experimentation--by increasing the space between the two shapes, and alternating which sides are glazed I can control how the light is reflected and transmitted. I found that in order to fire this form without distortion I had to make a second sitter form in the same clay body that mirrors the curve of the dome. The piece for the lamp get fired resting on top of the sitter (Fig. 7), which shrinks with the piece supporting it through the firing.

Fig. 5 - L3

Fig. 6 - Poul Henningsen's PH5

Fig. 7 - The top dome of L3 resting inside the sitter

I was having difficulty working with the large domes of thin porcelain, so I took the same concept of the opposing reflective domes and applied it to a desk lamp in the form of L5 (Fig. 8), which is supported by a heavy steel base and tube which houses the wires for the 5 mini LED flood light array positioned between the two dishes. The dome form is important because it widens the angle of emission, increasing the spread of the light.

Fig. 8 - L5

L4 (Fig. 9) is a bedside or desk lamp whose form is influenced by the need for a relatively substantial sized form that can withstand a high fire with minimal distortion, a problem I encountered with L2 and L3. After firing a couple of these forms it became clear, however, that if I fire them straight up they end sloping back while firing. I was able to minimize this by firing the forms on a slanted brick, which offsets the gravitational force that pulls the form backwards when fired. With the large opening at the top of L4 I am attempting to play with the formal concepts of interior and exterior, and where these can become one in the same. The shape of the opening allows users to direct the light, and allow the lamp to function as direct lighting for reading.

Fig. 9 - L4

The generalized BFA degree that is awarded by my college has allowed my focus to span across different mediums (ceramic, metal and wood), but all the while working in the mode of functional objects. It is my goal to maintain a similar gestural quality throughout all my objects, connecting them both visually and functionally. And while they remain physically separate, together they facilitate one environment.

My decision to make lamps and chairs stems from a passion to make functional objects that I developed in years prior to college working on the potters wheel. Continuing my ceramics work in college I sought out the precession and refinement that slip cast work afforded. This required me to gain mold making skills which were later applied to my work with bent plywood by way of a ten part male/female press mold.

I consider the lamp as a vessel that disperses light, and the manner in which it does so reveals the context under which it functions (e.g. ambient or direct lighting). Likewise, I see the chair as a vessel for a human, an object intimately incorporated into the daily routine.

Part II: Chairs

In 1946 Charles & Ray Eames in collaboration with Eero Saarinen entered the New York Museum of Modern Art's design competition, "Organic Designs in Home Furnishings" (Fig. 10). Experimenting with new materials, their winning submission was an upholstered bent plywood chair that formed to the body through compound curves. It was the original intention that the chair would be purely bent wood, but the upholstery was necessitated by cracking that occurred during the molding process. Plywood is a readily available material, and economical to manufacture, allowing the Eames's to create furniture that embodied their principal of "The best, for the most, for the least" (Holm 2). Eventually the Eames's went on to further develop the bent plywood molding process when they were commissioned by the government to make leg splints for soldiers of the Vietnam war. They discovered that the gaps in the split required to secured bandages around the leg where ideal for relieving the stress of the compound curves, and prevented cracking during the molding process (Organic 5).

Fig. 10 - The chair the Eames' and Saarinen submitted to the competition

Inspired by the work of the Eames's, my bent plywood chairs are generated from a single male/female press mold constructed from CNC milled MDF. My experiences creating the plaster molds for the lamps was a crucial foundation in developing the more complex geometry that was required to make the press mold. Similar to many of the Eames' chairs, I have chosen to use shock mounts to attach the wood shell to a leg base of bent steel rod. This economical method of construction enables the same shell to be used on different bases. Thus, through a single mold I can make various styles of chair (lounge, dining, rocking) by using different bases.

I start with quarter inch construction grade bending plywood, which is cut to size and then submerged in a water bath for a few hours. The soaking is necessary because it allows the wood to become malleable enough to form compound curves. I lay up the soaked plywood without glue in the press mold for a couple days, letting the plywood dry out enough to accept the glue . I use a powdered urea formaldehyde glue that mixes with water for three reasons. First, the biproduct of the chemical reaction that occurs when the glue cures is ammonia, which dissolves the lignens in the woods making it more flexible.

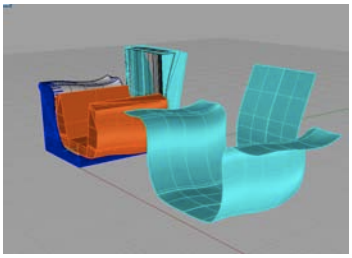

Fig. 11 - Rhino model of the chair and parts for the mold to be milled

Fig. 12 - The individual parts of the male and female sections

Fig. 13 - Cast urethane mounts get laminated to the chairs and fastened to the frame with a nut

Fig. 14 - The mold all clamped down

Second, because the glue is water based it absorbs excess water that the wood retained from the soaking, ensuring the strongest bond possible. And lastly it takes the glue a couple hours to set, giving me ample time to clamp up the mold. After I do a wet lay-up with glue I get the shell out of the mold and cut the final, rounded form out with a jig saw and rotary tool (Fig. 15). Then I applied a layer of birch paperback veneer to both sides of the shell, this proved to be very difficult due to the compound curvature that I achieved with the soaked plywood (Fig. 16). In many places, especially on the largest chair, I had to cut the veneer with a blade, fold it over, and then go back later and cut off the excess and fill any seems that showed. While this was undesirable, it was still immensely cheaper then doing a complete veneer lay-up, which would have been ideal if I had the funding.

Fig. 15 - The last layup which included armrests, half of the form has been cut out

Fig. 16 - CH4 with the rocker base attached

The legs (Fig. 17) begin as four lengths of half inch hot rolled steel rod, which are bent to match a set of working drawings, then welded together to form the base structure. Two plates are added to the top of the base provide a space to attach shock mounts, which are laminated to the wood shell. The mounts made of cast urethane rubber with embedded hardware to enable the mounts to connect to the base frame with six bolts.

Fig. 17 - Steel rod base after sanding and steel wool

Conclusion

It is only through the use of digital fabrication that I was able to build a press mold this complex. Comprised of ten separately milled pieces, the precision of CNC milling has enabled me to create forms that would have once only been achievable through industrial manufacturing.

It is imperative for the coming generation of designers and craftsmen that knowledge of materials continues to dictate the making process, and that digital fabrication process are implemented sparingly as any other tool. My studies have shown me that the the most effective way to build objects in the coming age will be through a hybrid method of digital and traditional skill based processes. Undoubtably, the mold making potential of CNC milling affords new possibilities to craftsmen with access to these resources, however the digital technologies which enabled my work have been in development throughout the last decade, while the methodologies of craftsmen have been refined throughout centuries. The significance of this project entails the achievement of a greater understanding of form, material and process. In the wider context I hope my objects will evoke an appreciation of materials within my audience, as well as inspire the desire to use these objects.

Sources

O'Rorke, Margaret. *Clay, Light & Water*. London: & C Black, 2010. Print.

Hückelheim, Arne. *DiwaliOilLampCrop*. Digital image. *Commons.wikimedia.org*. 5 Nov. 2010. Web. <http://commons.wikimedia.org/wiki/File:DiwaliOilLampCrop.JPG>.

Holm, Bill. "IDEA-Winning Materials Program: Now One Year Old." *IDEA-Winning Materials Program: Now One Year Old*. Herman Miller, 28 Apr. 2010. Web. 18 Apr. 2012. <http://www.hermanmiller.com/discover/idea-winning-materials-program-now-one-year-old/>.

"Organic Chair & Organic Highback." *Vitra.com*. Vitra. Web. 18 Apr. 2012. <http://www.vitra.com/en-us/home/products/organic-chair/overview/>.