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# Designing with geometry

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DESIGNING WITH GEOMETRY

by

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A thesis submitted in partial fulfillment  
of the requirements for the Master of  
Arts degree in Art  
in the Graduate College of  
The University of Iowa

May 2016

Thesis Supervisor: Professor Steve McGuire

Graduate College  
The University of Iowa  
Iowa City, Iowa

CERTIFICATE OF APPROVAL

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MASTER'S THESIS

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This is to certify that the Master's thesis of

Maria Lorena Padron

has been approved by the Examining Committee for the thesis requirement for the Master of Arts degree in Art at the May 2016 graduation.

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## PUBLIC ABSTRACT

When I design an object or a piece of furniture I do it with geometry in my mind. I use simple shapes like squares, rectangles and lines to create forms that then become an object. I organize the shapes in space thinking about the negative and positive space that they create. I also think of how each shape interacts with each other. The overall shape of an object contains other shapes inside, and these shapes create a relationship between each other in space. I also consider how geometry relates to the function of the object. In my designs, geometry and function shape the object.

In this essay I describe the design and production process for a cheese tray, a night lamp and a candle holder. I talk about how I used geometry to design each one of these objects and the production process involved.

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## DESIGNING WITH GEOMETRY

### BAMBOO CHEESE TRAY

#### Design

I designed this bamboo cheese tray starting with simple shapes. The bamboo cheese tray is square, and inside it contains rectangles and lines that are in balance with each other and with the negative space. Each rectangle in this tray intersects with the others to create a relationship in space. Each rectangle is differentiated by its depth. These rectangles are designed to hold different types of cheese. There are three rectangles, one of the rectangles is a place to put a container 3d printed in ceramic to hold olives, spread, or nuts. The tray also contains lines in one of the sides, these lines are designed to hold a baguette. These lines are shallower than the rectangles so that crumbs can be easily clean. These lines create a contrast with the squares that hold the cheese.

#### Production

To produce this cheese tray I first drew it by hand, then transferred my drawings to AutoCAD. In AutoCAD I designed the squares and lines to be milled by the CNC router. Then I loaded my AutoCAD drawings into PartWorks, a software to be used by the CNC router. In PartWorks I defined the different depths of each cut. I used a sustainable bamboo plywood, 4'x4' sheet. The CNC router cut the tray and also milled the squares that had different depths to differentiate one from the others. After the tray was cut by the CNC router I had to cut the tabs that the CNC router leaves with a hand router. Then I sanded the tray.



The last step is to varnish it with mineral oil. This oil is food safe.



*Figure 1 Bamboo Cheese Tray*

## NIGHT LAMP

### Design

The idea of this lamp was born from two cubes intersecting each other. I started making sketches, drawing two intersecting cubes, one bigger than the other. Then I changed the cubes to cuboids, one for the base for the lamp, with two others that were wider but shorter than the base. Then I divided one of the cuboids in two. After that the idea evolved into a cuboid wrapped by two ribbons of irregular shapes.

The night lamp is made out of two types of wood: walnut and birch. The base is made out of birch, giving it a lighter color. The two other shapes that intersect with it are made out of walnut, which has a darker color. The two different types of wood emphasize the different shapes, and the relationship between these shapes.

This is a night lamp, so the light it creates is warm and soft. The wood contains the light, which escapes only from small openings in the first layer of the lamp. The openings are behind another layer of wood, so the light escapes from the cracks, then meets a wall of walnut wood, and then reflects to the exterior.

### Production

I drew the pieces for the lamp in AutoCAD and then exported them into Laser Works, a software for the CNC laser cut machine. I cut the wood using a CNC laser cut machine. I used a sheet of walnut and birch that was  $\frac{1}{4}$  inch thick, so it was thin enough for the laser cut machine. I used a sheet of solid birch and solid walnut wood. After I cut the pieces I assembled them using wood glue. Then I assembled the electrical part on it. After this, the final step was to put a coat of wax.



*Figure 2 Night Lamp*



*Figure 3 Night Lamp*

## CANDLE HOLDER

### Design

I designed his candle holder starting with a cuboid, a very simple shape. Then I chamfered

some of the sides to make them tilted. One side is chamfered at a 45 degree angle, while the opposite side is chamfered at a 30 degree angle. This makes the candle holder seem unstable, it appears as if it will tilt to the side. The other two sides are also chamfered at 45 degree angles. There is a circle indentation to place the candle. This is centered with the square part of the base, making the candle holder stable. The candle holder can be picked up by the side, the chamfer at 30 degree angle creates a shape easy to hold.

### Production

I started cutting with a band saw the cuboid shape. Then I made the hole for the candle with the drill press. After that, I marked the angles in each side, and cut the angles also with a band saw. After this I sanded the candle holder. Then I varnished it with mineral oil.



*Figure 4 Candle Holder*

## CONCLUSION

The use of geometry in design is essential. I use geometry in all my designs. I use simple shapes like rectangles and squares, circles, lines and dots. Then I convert these shapes into

volumes. After that the shapes become an object. I also think of the function of the object and how the shape can originate from the function, the concept that form follows function was born with modern architecture and industrial design in the 20<sup>th</sup> century (Wikipedia). In my designs, I combine function and geometry to create objects.

## REFERENCES

Wikipedia. *Form follows function*. Retrieved from  
[https://en.wikipedia.org/wiki/Form\\_follows\\_function](https://en.wikipedia.org/wiki/Form_follows_function)