

Maxwell Brake

Domed Labyrinth

The piece of art that I have created is an exploration of arched construction and a reflection on architecture and the skills involved in its creation. The project has manifested itself as model for a dome. The dome has an oculus that casts the shadow of a labyrinth onto the floor below it. The dome creates a physical space that reflects on the physical construction of architecture, while the labyrinth has historically been a tribute to the complexity and beauty of classical and medieval architecture (Doob 1990). Thus, the Domed Labyrinth allows for my own reflection on the complex concepts that are embedded in Medieval and Classical Architecture as well as reflection on the creation of architecture in the form of a model.

Conceptual Process and Personal Edification

Through careful deliberation I set a challenge for myself that my IP project has fulfilled. I decided that the creation of my final piece should be an opportunity for me to learn the things that most interest me while also using some of the other skills that I have acquired while at A & D. With this in mind, the creation of my domed labyrinth has allowed me to use my skills as a sculptor and designer and to discover some of the principles and technicalities that go into creating an architectural piece. This challenge also became much more about the creative process and the discovery of information relating to architecture than it has been about the creation of one final piece. My research in architecture practice books, which originally stemmed from an interest in the structure

of the arch, such as Structure in Architecture, Architecture and Engineering, and Structural Design in Architecture by Mario Salvadori, has given me information about how and why physical structures work. This research has also inspired me to create different models that put architectural principles into physical forms that efficiently and creatively use the compressive strength of their materials.

The basic structural ideas that I first started to experiment with drew on the idea that a simple change in shape or curvature can greatly increase the strength of a material. Mario Salvadori gives the simple example of holding out a piece of paper by one of its edges. Obviously it will bend and fall over. But, if you hold the same piece of paper by its edge after creasing it down the center, it can easily support its own weight as a cantilever. (Salvadori 1990) This led to my creation of my own folded paper arches and also the creation of a folded paper vault. Using 1 ply paperboard in conjunction with these construction principles to give the material more compressive strength I created a folded structure that supports a weight that was proportionally more than several times the weight of the paper structure itself. These experiments gave me a shallow but interesting look at some basic architectural ideas on how to deal with structure.

Images 1 2 3 (folded paper arch and folded paper vault, folded paper vault supporting books)

With the creation of these paper models I returned to the structure of the simple arch to discover more about the compressive strength of the materials and the ways that materials can be used to allow for more efficient bearing of loads. I looked at both the catenary arch and parabolic arch as a template for the arch and its behavior under a static

amount of weight. I then used the catenary arch as a template for the physical form of the dome.

A catenary arch is determined by hanging a chain upside down from two ends. Under its own weight the chain will droop to form a curve. If this curve were to be turned right side up it would represent the ideal form for an arch to follow (Salvadori 1975). Under the stress of its own weight, the line created by the catenary would also represent the line of pressure that runs through an arch that is made of a compressive material, like brick. If this pressure line is not contained within the walls of the arch the arch can fall (Heyman 1996). In the case of my dome the walls did not perfectly follow this template and many cracks started to pop up in the brickwork. This was especially true towards the top of my dome where I made significant departures away from the catenary curve.

Another idea to be considered when working with a dome based off of a catenary is the outward thrust that the material puts onto the base of the structure. The thrust of this type of arch onto its base follows a rule of inverse proportion to the rise (height) of the arch. (Image 4) So ideally an arch with higher rise and smaller span would exert less outward pressure onto its bases (Salvadori 1981). With the proportion system that I set up for my dome (36 inch span, 18 inch rise) the outward thrust would have been large and the inherent value of using a catenary as a template to create a structure that bears its own weight efficiently was negated. But because of the thin, shell-like nature of the dome that I created and the large heavy bricks that made up the frieze portion of the dome this stress became a non-issue. (Image 4)

Aside from principles that governed the physical construction there are also principles that guide the aesthetic look of a piece of architecture. Unfortunately the

semester was a bit too short for me to dive too deeply into this but there were some decisions about the aesthetic look of my dome that were influenced by medieval and classical ideas.

“Just as all the individual members harmonize in an animal organism, so all the separate parts of a building should harmonize.... Each part of a building must correspond to all others so as to contribute to the success and beauty of the whole. the building cannot be beautiful in only one of its parts while the others are neglected; all must harmonize in order to appear as a single well articulated body, not a jumble of unrelated fragments.”

-Leon Battista Alberti

With these ideas I found great examples of geometrical harmony in architecture in both English Gothic window tracery and in the floor plans of many medieval cathedrals. For example, Marie-Therese Zenner notes in her essay on St Etienne at Nevers that the architect's used circles with three different radii in relation to each other to draft out the floor plan of the cathedral in a way that created a relationship between all of its parts. (Image 6) English gothic window tracery has also produced some stunning examples of simple geometry being repeated and used to create complex and beautiful results. This not only influenced the form of my dome but also inspired me to try to create a tracery design of my own. My design is nothing compared to the masters of the English gothic but it gave me an idea of just how complex and difficult their designs could be, while just using a circle and an arch to create form (Image 5).

Getting back to my dome; I tried to create a horizontal and vertical rhythm by altering the size of the bricks that composed the structure as they went from top to bottom. I started with a cardboard model that created quadrilateral divisions in the walls of the dome. Then using these quadrilaterals and Rhino as a modeling tool, I changed the

proportion of bricks in attempt to create a rhythm. I reversed the size of the bricks which at first went from smaller to larger starting at the base of the dome and going up. I did this by using the percentage of the total height that each brick represented and flipping it upside down. I then did the same thing to the pillars underneath so that the final result were brick sizes that were largest in the middle of the dome and decreased in size as they went toward the top and toward the bottom. Again this is simple and somewhat obvious compared to the work of medieval and classical architects, But it was my attempt at a geometrical relationship in the form of my dome. (Image 7)

Historical Context

My Domed Labyrinth project has been strongly influenced by the historical precedents set by medieval and classical architectural forms. I have been inspired by the classes I have taken in the pursuit of my Art History Minor, many of which have related directly and indirectly to this project. I was also greatly inspired by my experience during my study abroad in Italy.

The Dome

The dome that I have created was inspired first by my experimentation with the creation of arches. In Roman and medieval times the arch formed a gateway into a space that often denoted a change in the attitude of the people entering the space. The arch was a sign of the sanctity either of the person entering through the arch (in the case of a Roman Ruler passing through a triumphal arch) or the sanctity of the space being entered (in the case of the arched portals at the entrances to medieval cathedrals) (Smith 1956).

Whether as the entrance to a city or the entrance to a building the arch has often been used as a symbolic doorway into a space. The arch creates an entrance that denotes a change in the state of mind for the person entering (Smith 1956).

While the arch was starting point for architectural exploration both physically and conceptually, I desired to make a piece that was larger and more of a physical shelter from the elements. For this reason I decided on the dome.

The Labyrinth

The Labyrinth also has its origin in classical mythology and has been used as both a tribute to an architect as well as to architecture. It also has symbolic and sacred connotations that reach beyond its physical structure into the metaphysical realm. The Labyrinth originates with the Greek myth of the architect Daedalus, who was commissioned by King Minos to create a Labyrinth to contain and trap the Minotaur. King Minos eventually betrays Daedalus locking him in his own Labyrinth, however the clever Daedalus escapes and outwits the King leading to the King's eventual death. Daedalus is given homage as the original architect and becomes a symbol for medieval architects to compare themselves to. The legendary labyrinth that Daedalus created became a benchmark for the medieval architect. These architects created churches and cathedrals that would have most certainly rivaled the genius and artistry of Daedalus (Doob 1990).

For this reason many Medieval Cathedrals contain labyrinth patterns shown on their stone floors or carved into a wall. These labyrinths serve multiple functions. First as already noted they give tribute to Daedalus, but they were also a way for the Cathedral's architect to align himself with this great myth. These labyrinths also serve as a reflection

on the complexity of the Cathedral that contained them. And finally walking through the labyrinth was a way to meditate on the complexity and vastness of the God that the Cathedral was built for (Doob 1990).

Image 8 (Chartres Cathedral and Labyrinth)

My own admiration for the complexity and beauty of Classical and Medieval architecture has led to the incorporation of these two components (dome and labyrinth) into a single piece of art. In my desire for knowledge in physical construction I have learned about classical and medieval architectural structures, and have used them as a guide and an inspiration for my own work. And like the medieval architect I have created a labyrinth as a way to pay homage to the complexities of architecture and to the genius of previous architects.

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Images

Images 1 2 3

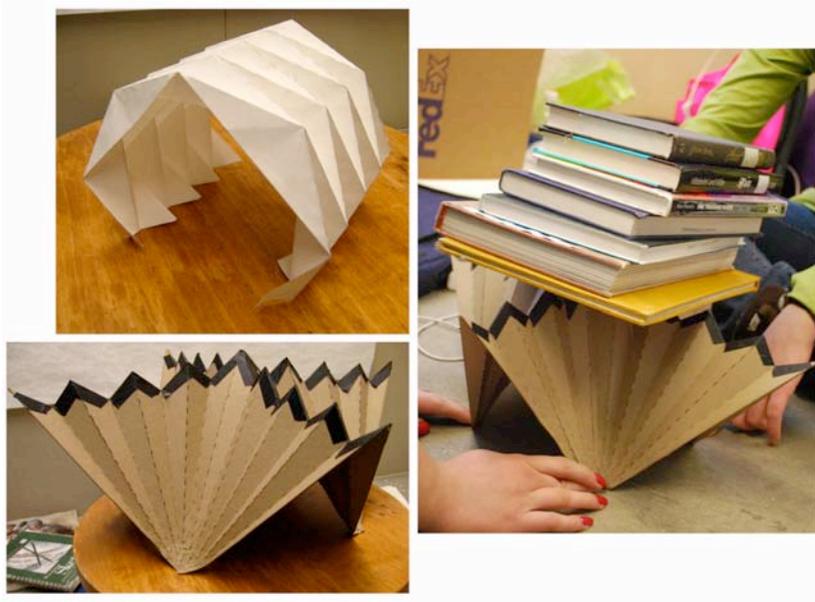


Image 4

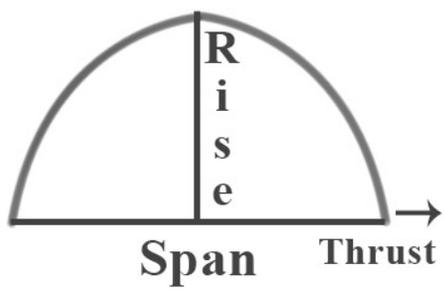


Image 5 Personal design compared to English gothic design, from . Medieval Church

Window Tracery In England

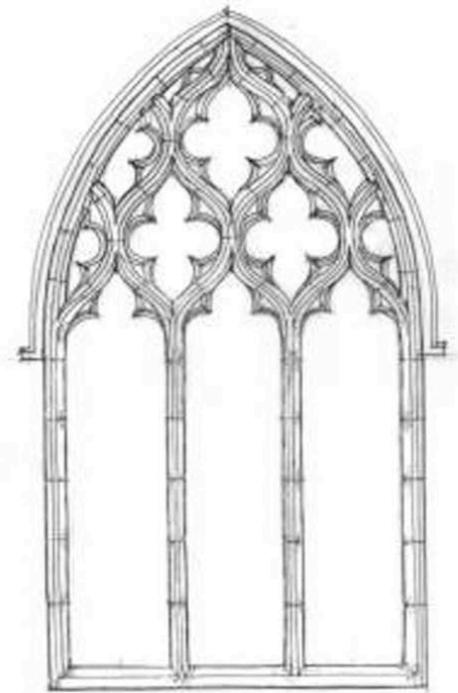
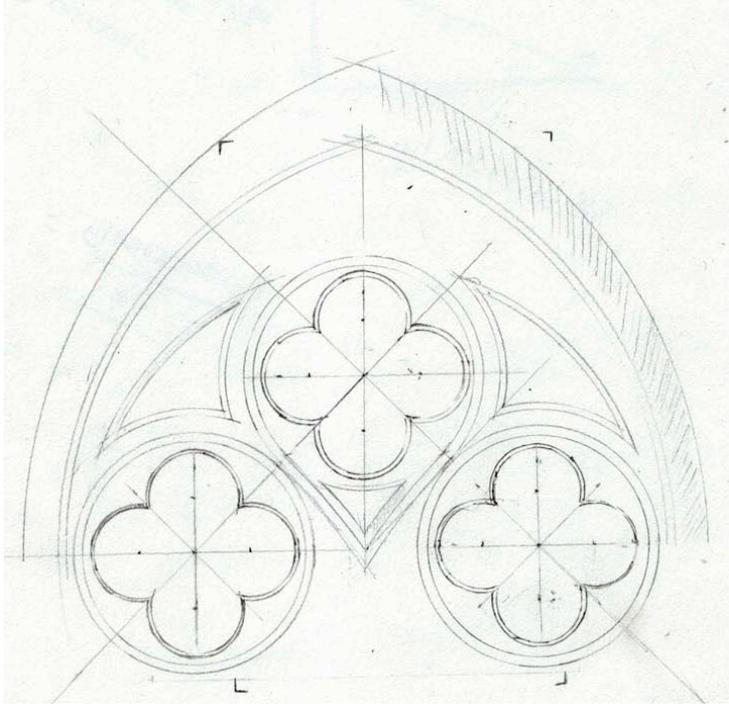


Image 6 Floor Plan St. Etienne in Nevers from Ad Quadratum. Edited by Nancy W. Wu

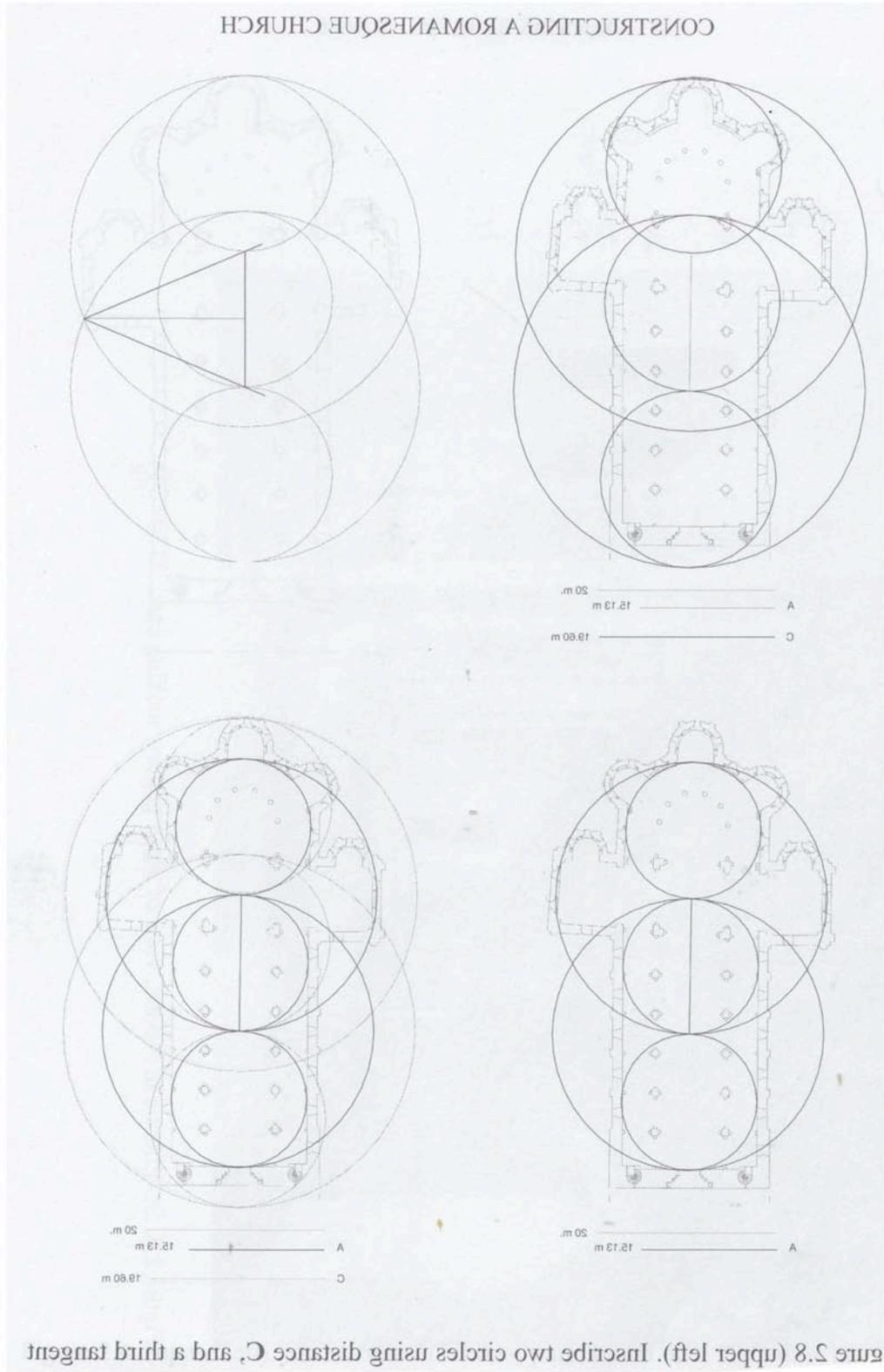


Image 7

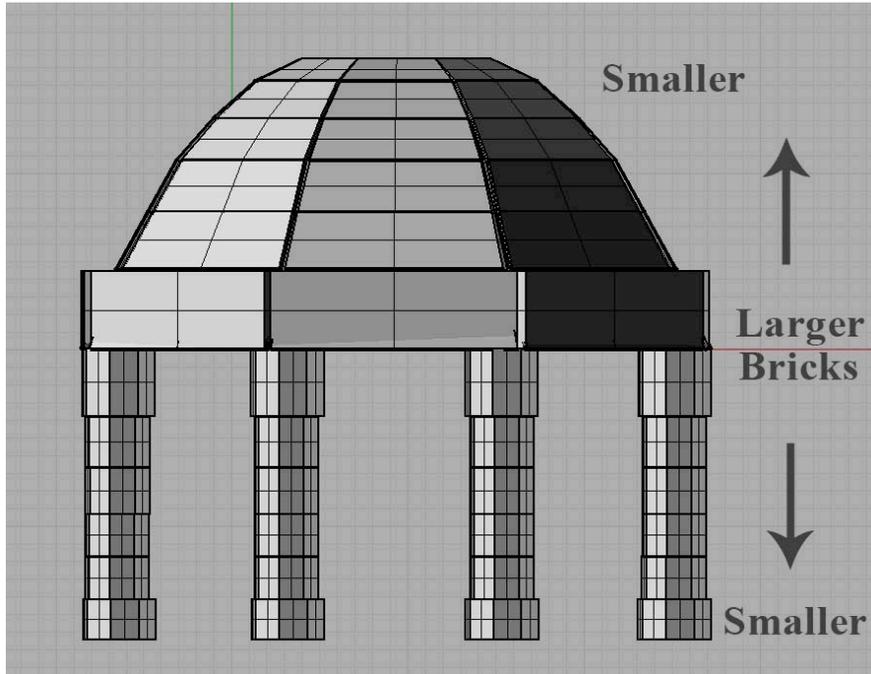
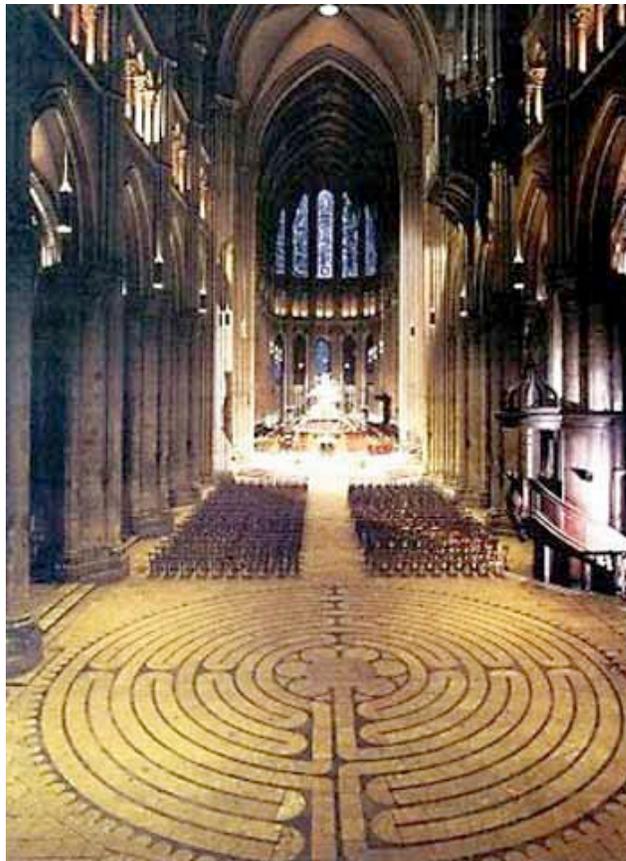


Image 8 Chartres Cathedral Labyrinth from www.crystalinks.com/labyrinths.html



My Domed Labyrinth

