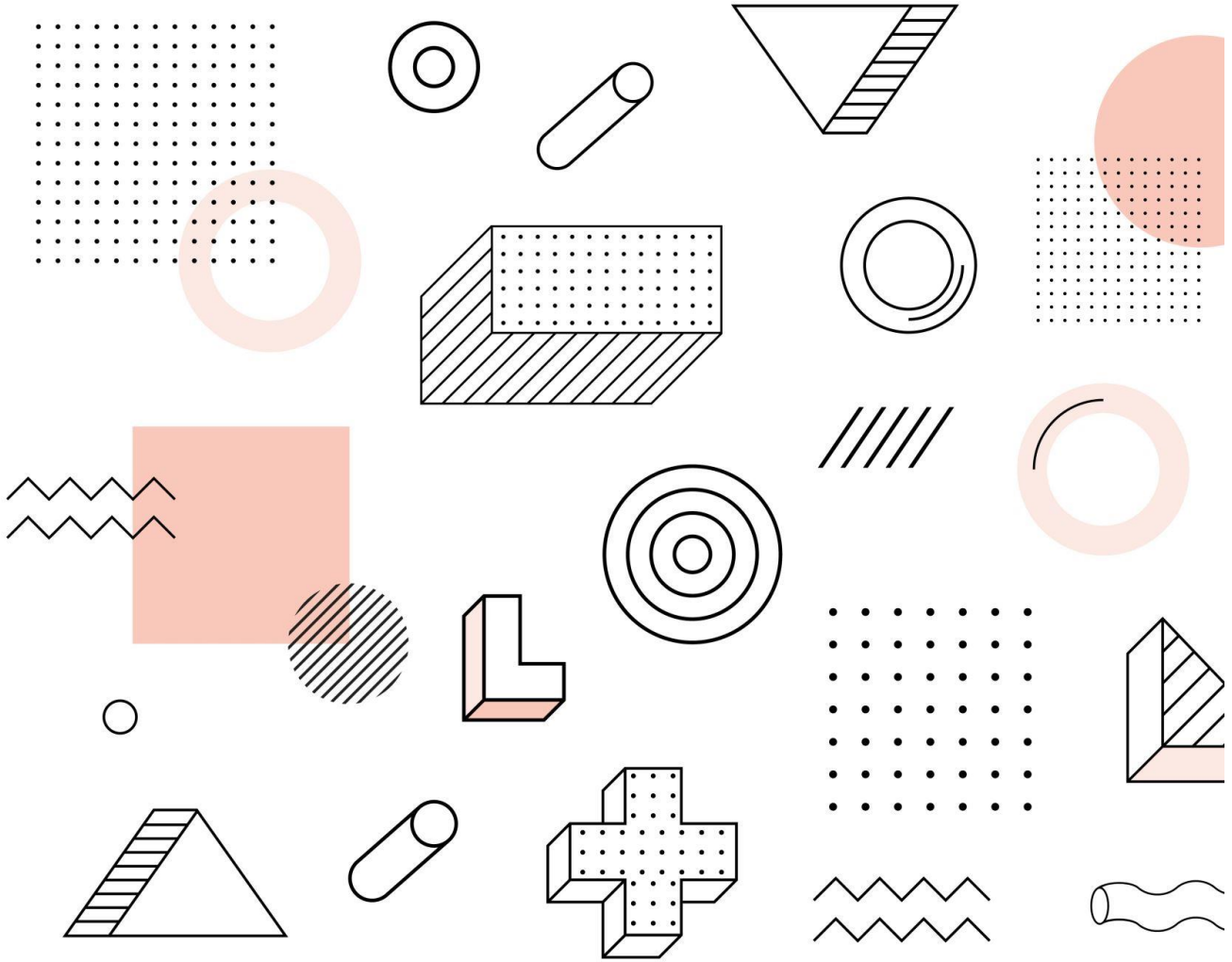
McGraw Clock Tower:

From Concept to printed 3D Model

Edward Camacho

Cornell NanoScale Facility



Outline

Motive

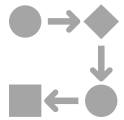
Research

Specifications

Software

Concept to STL

STL to Printed Model



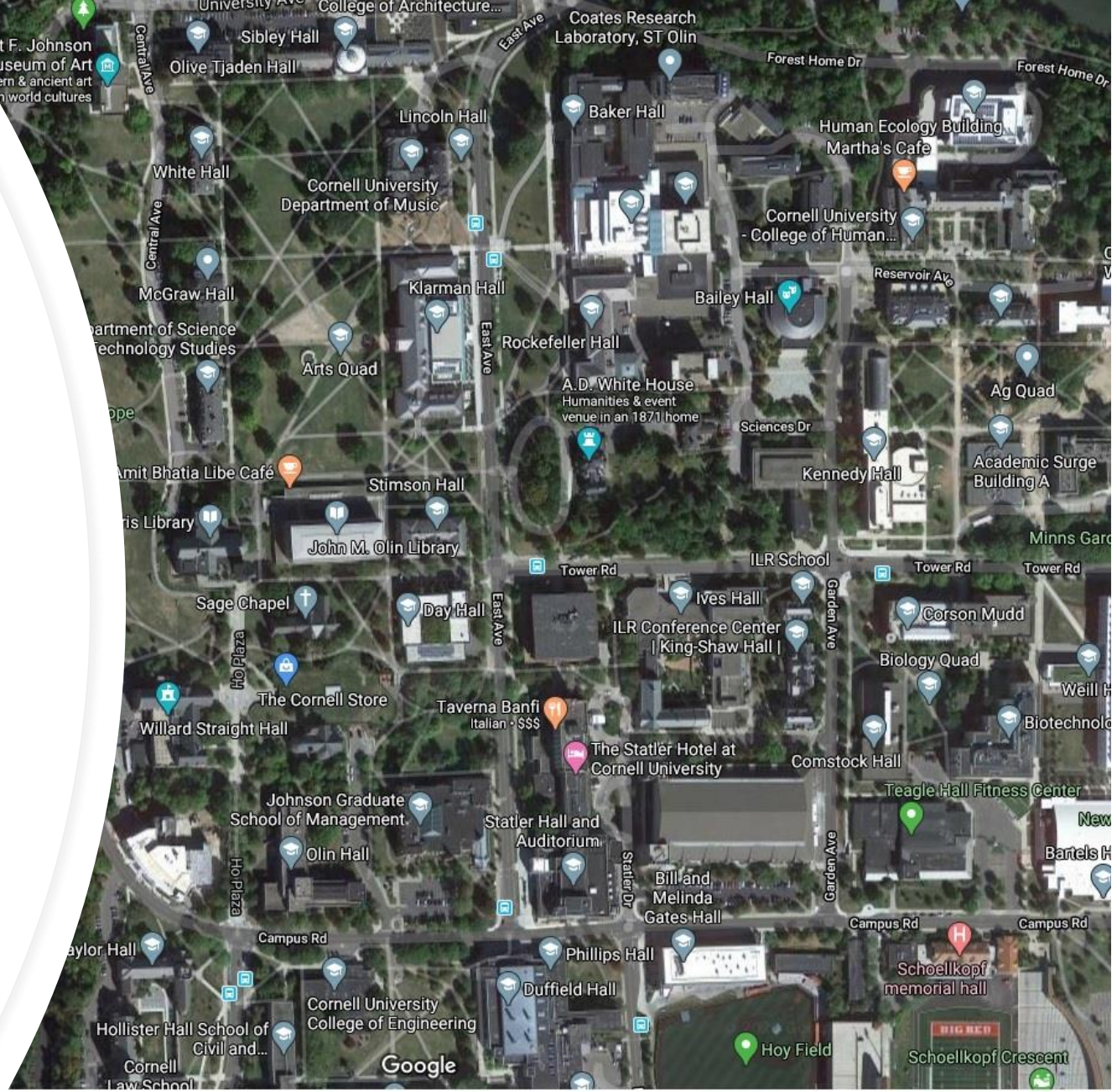
Work in Progress

Motive

- Reverse Site Visit: **May 4th**
- Show piece for New Equipment Acquisitions
- It needed to both unique and iconic to Cornell

Cornell's Architecture Made Good Choices

- Duffield Hall
  - CNF Cleanroom
- Johnson Museum
- Olin Library
- Sage Chapel
- Barnes Hall
- Uris Hall



Research: Historical Information [Part 1]

Uris was planned to be built as early as 1863 but it was not

It was built between 1888-91due to the Great Will Case

Jennie McGraw's will over her inheritance to Cornell

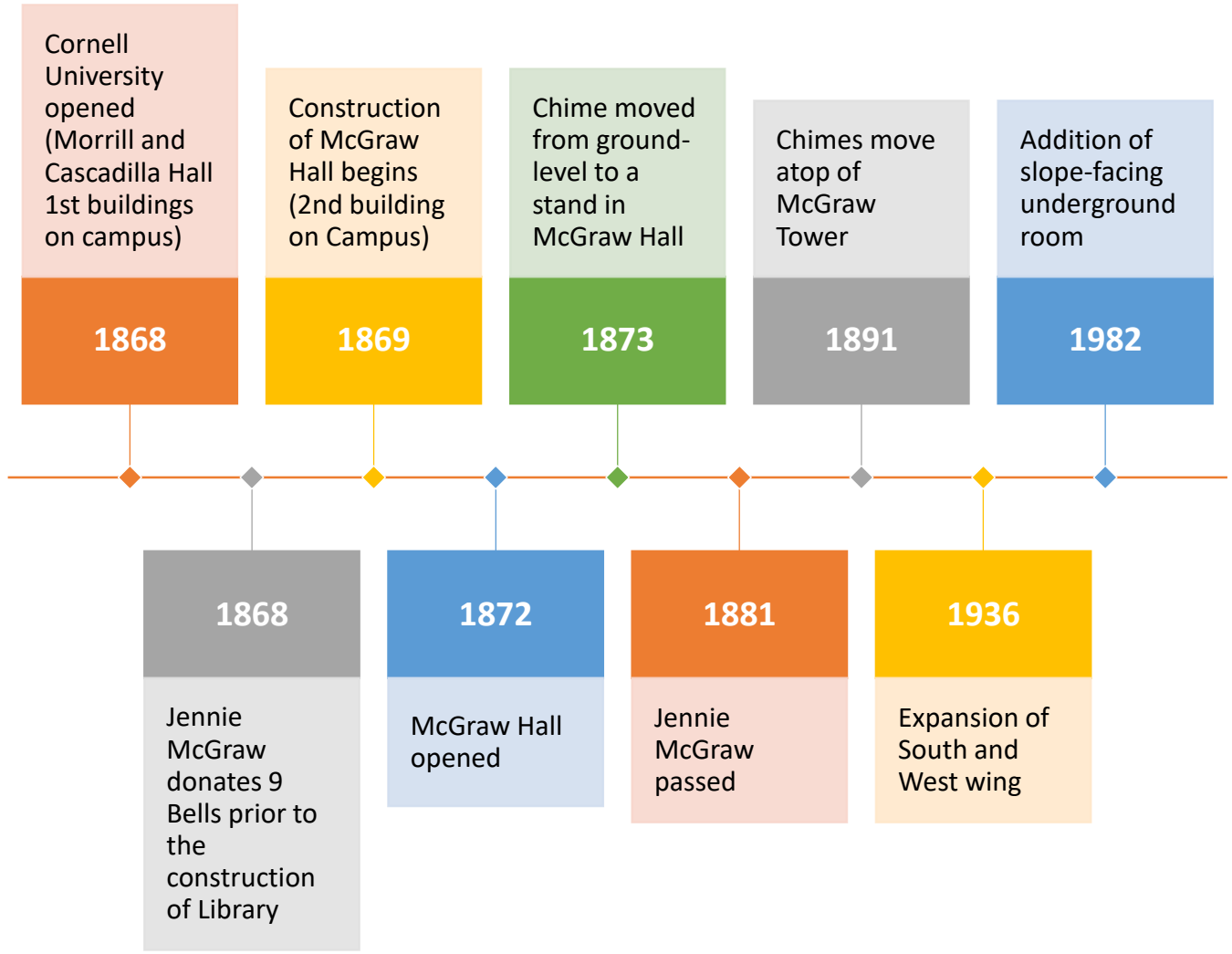
Daniel Willard Fiske (Cornell's first librarian) after a falling-out with the board of trustees sued to invalidate the will his dead wife

Law forbid women donating more than ½ of fortune to charity

Supreme court ruled in Fiske's favor

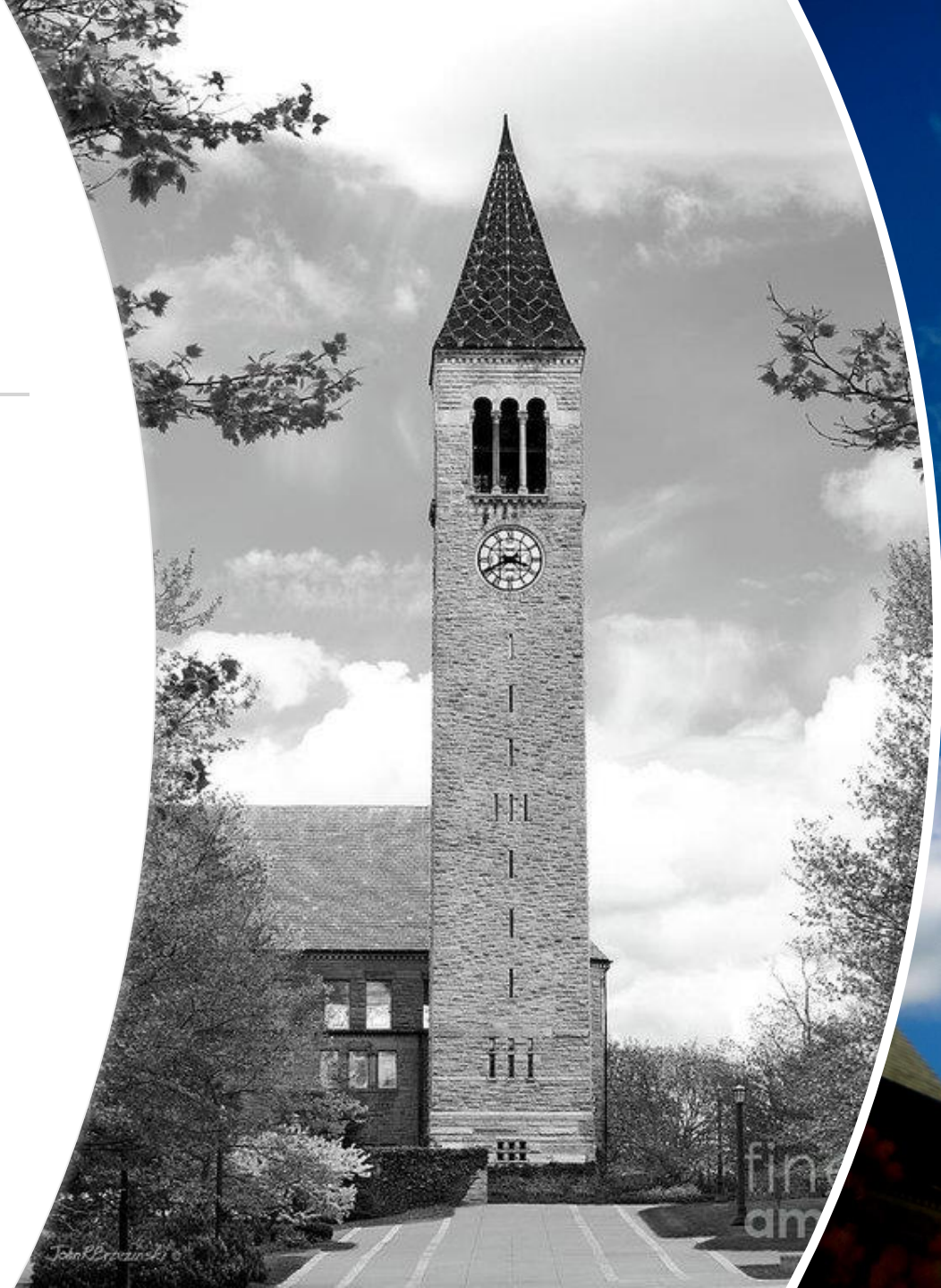
Trustee Henry Sage ended up using his own money to build the Library.

Research: Historical Information [Part 2]



Specifications

- 173-foot tall (53 meters)
- 161 steps
- 21 Bells
- Side are mostly identical
- Two type of stairs
- Tower has a few floors on top.
- The roof is a pyramidoid
- Romanesque Revival Architecture style



Clock

- Is a restored 1875 Seth Thomas Clock
- 14-foot pendulum
- Clock was linked to the Global Positioning System in 1999
- Clockwork and pendulum can be seen from the inside of the tower.

Software: Used

Autodesk Inventor

FreeCAD

GIMP

Microsoft Paint

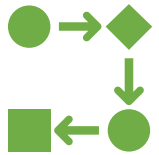
Design Approach

Inspect and Measure available pictures

Create a proportional scale set of measurements

Sketch

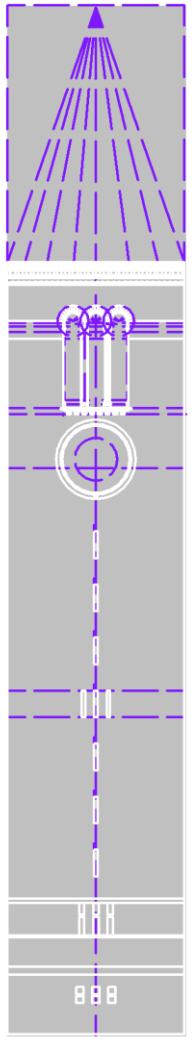
Extrude

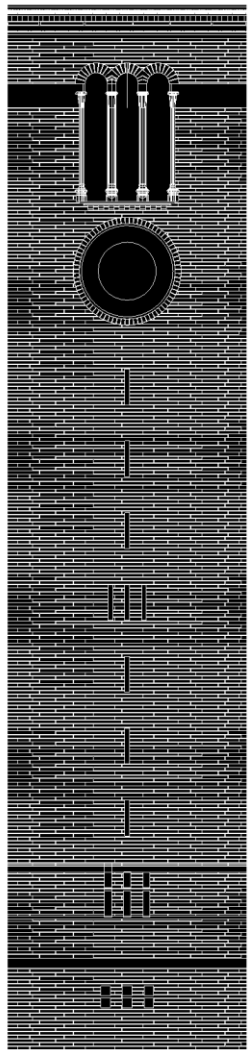


Assemble

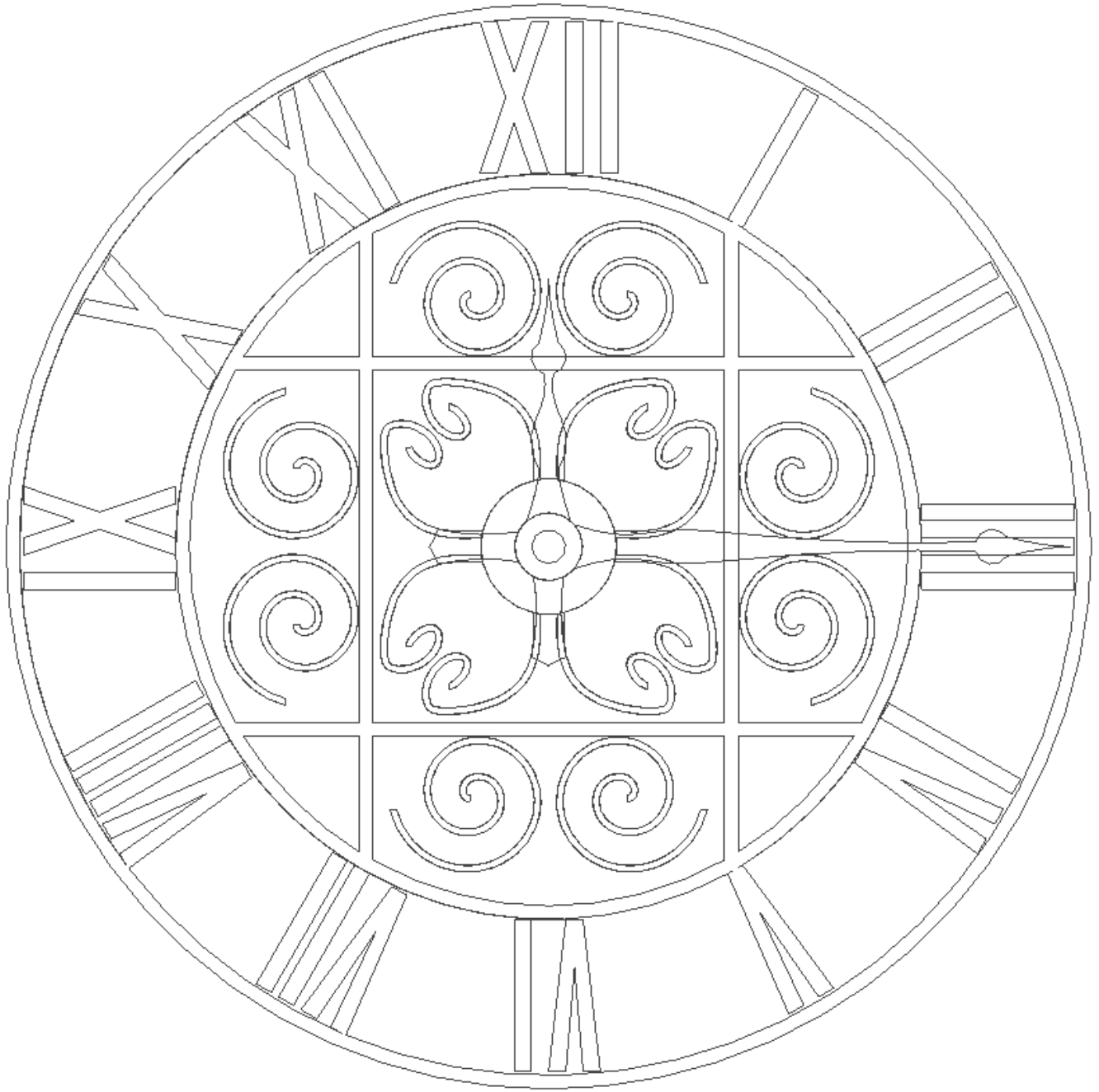
Make change to each step as needed

Sketch: Wall

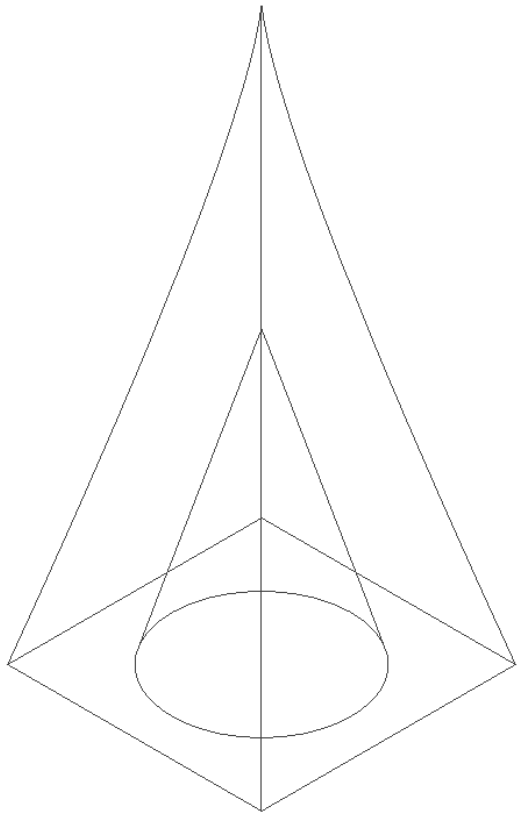


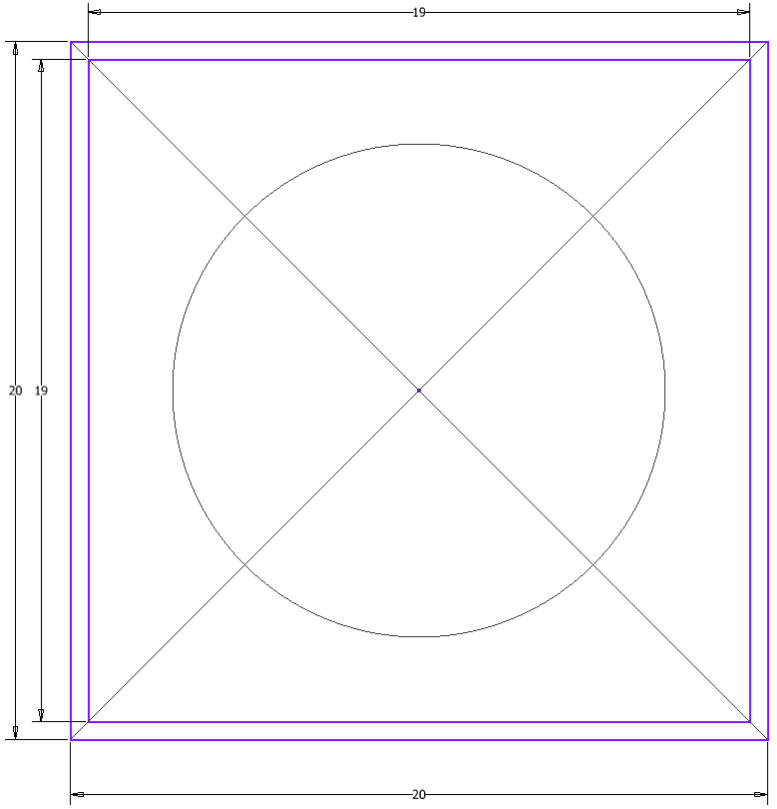


Sketches: Clock

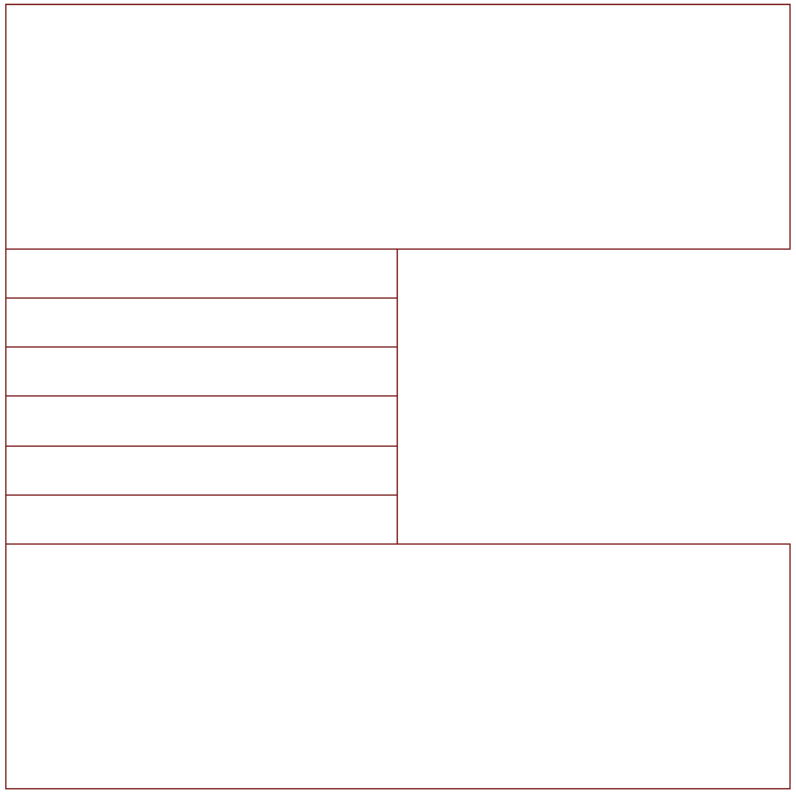


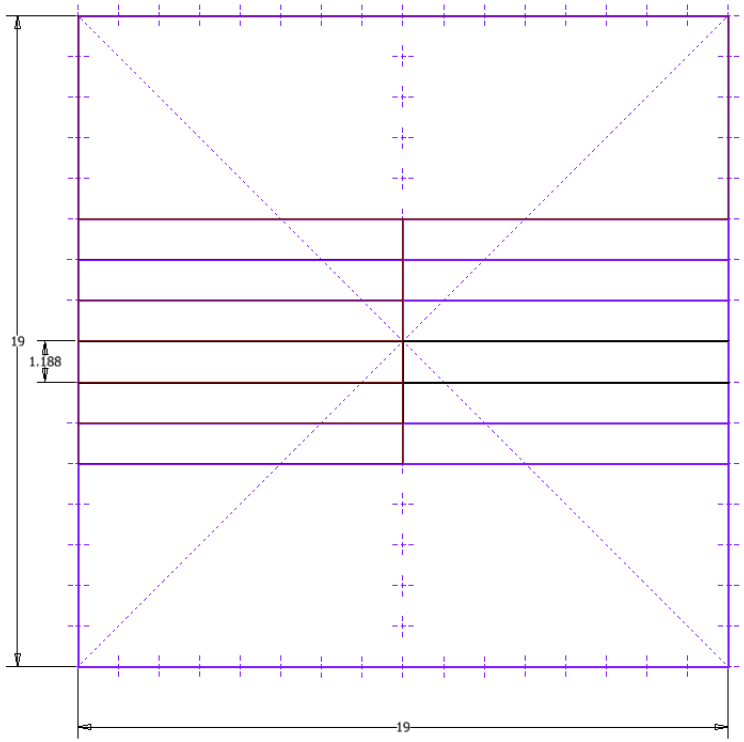
Sketch: Roof



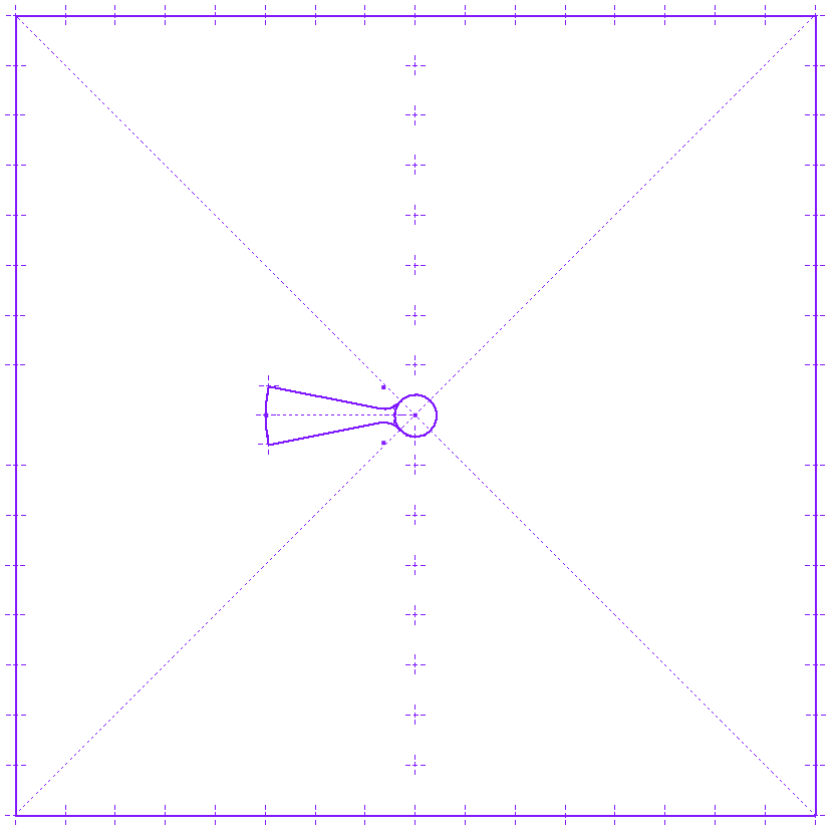


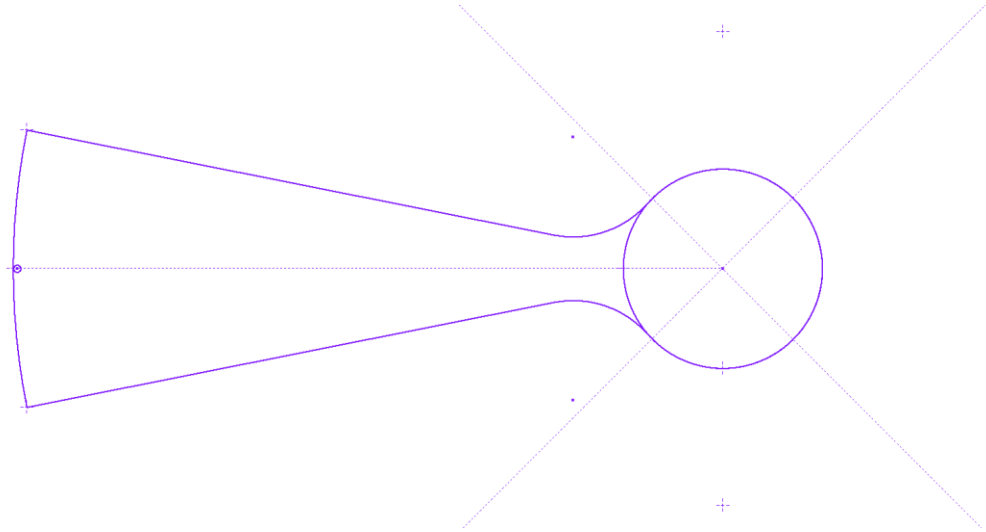
Sketch: Staircase



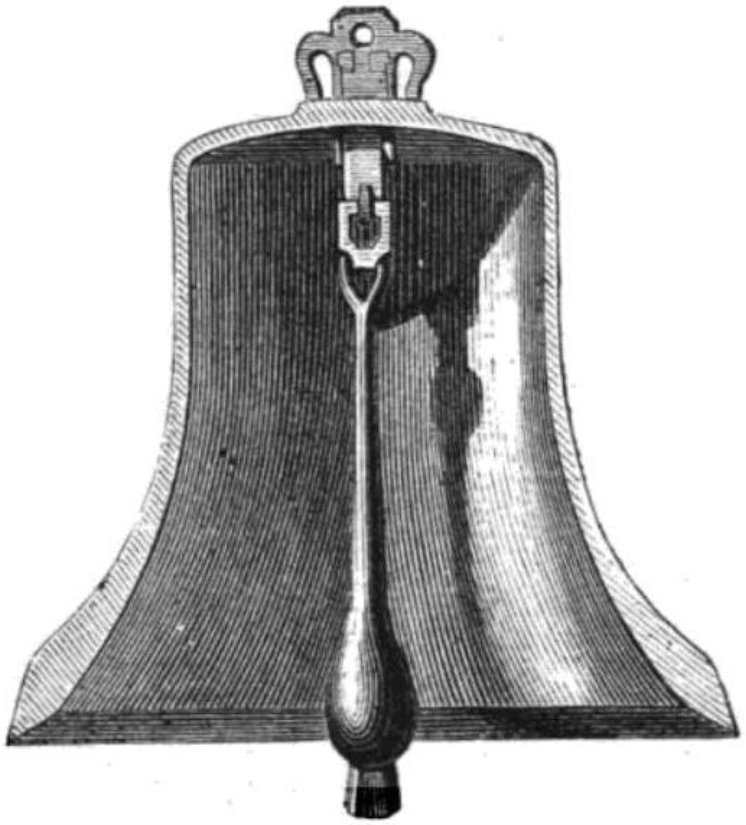


Sketch: Spiral Staircase

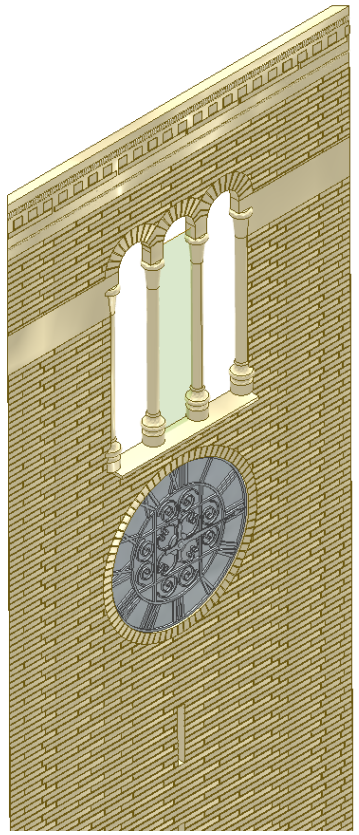


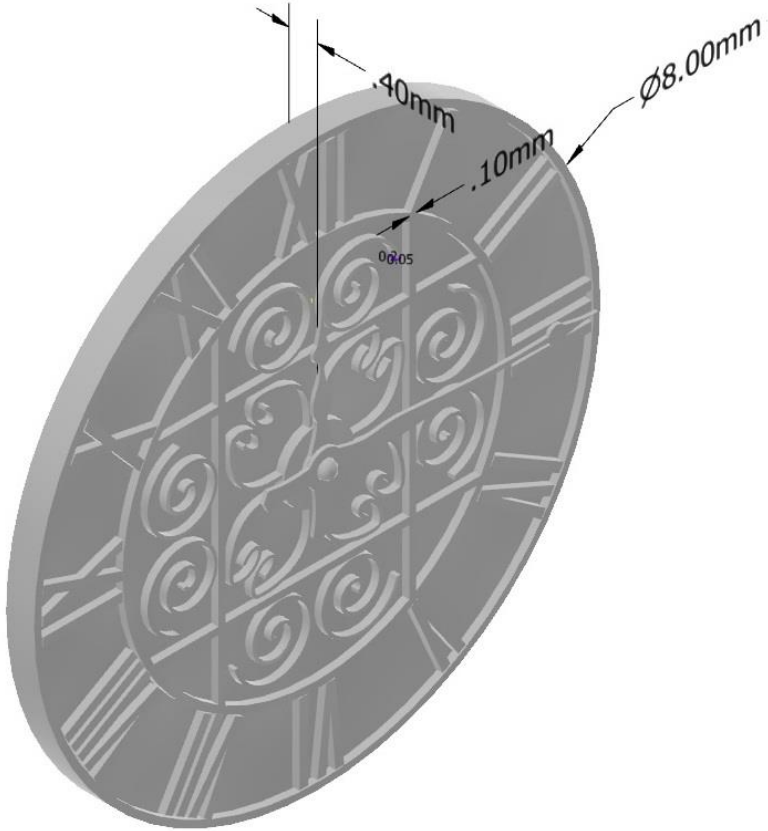


Sketch: Floor & Bells & Bell Supports (Under Construction)

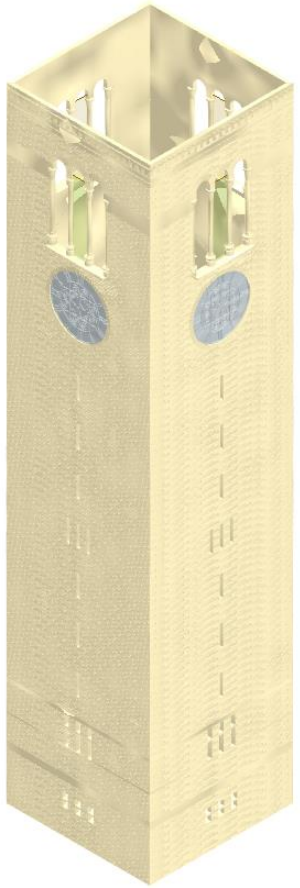


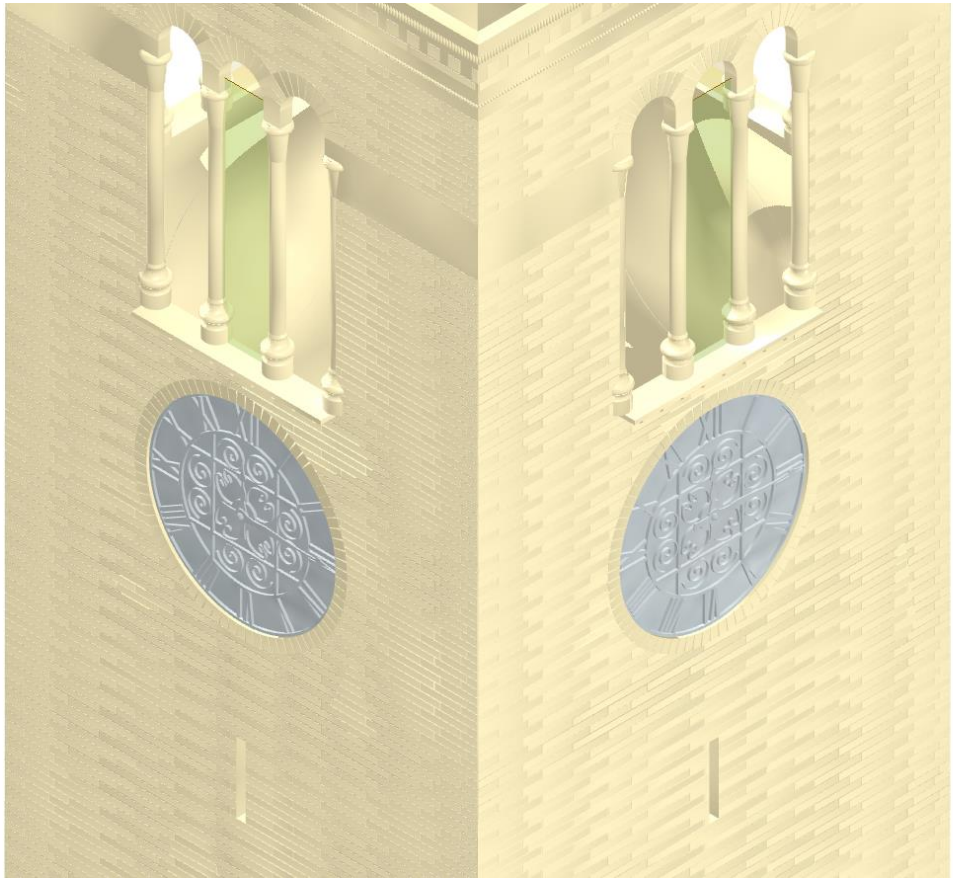
3D Extrusions: Wall + Clock



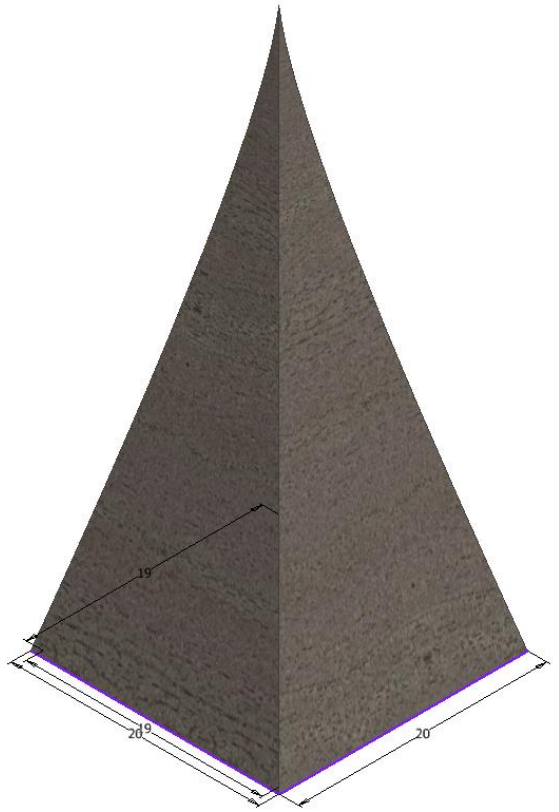


3D Extrusions: 4 Walls

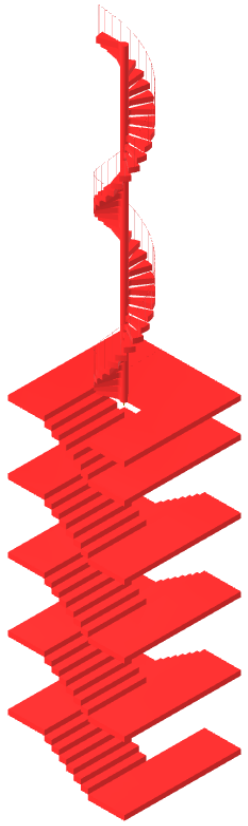


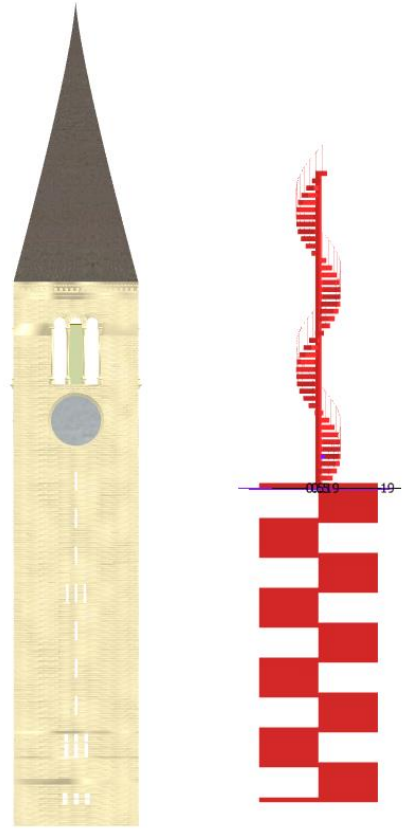


3D Extrusions: Walls and Roof

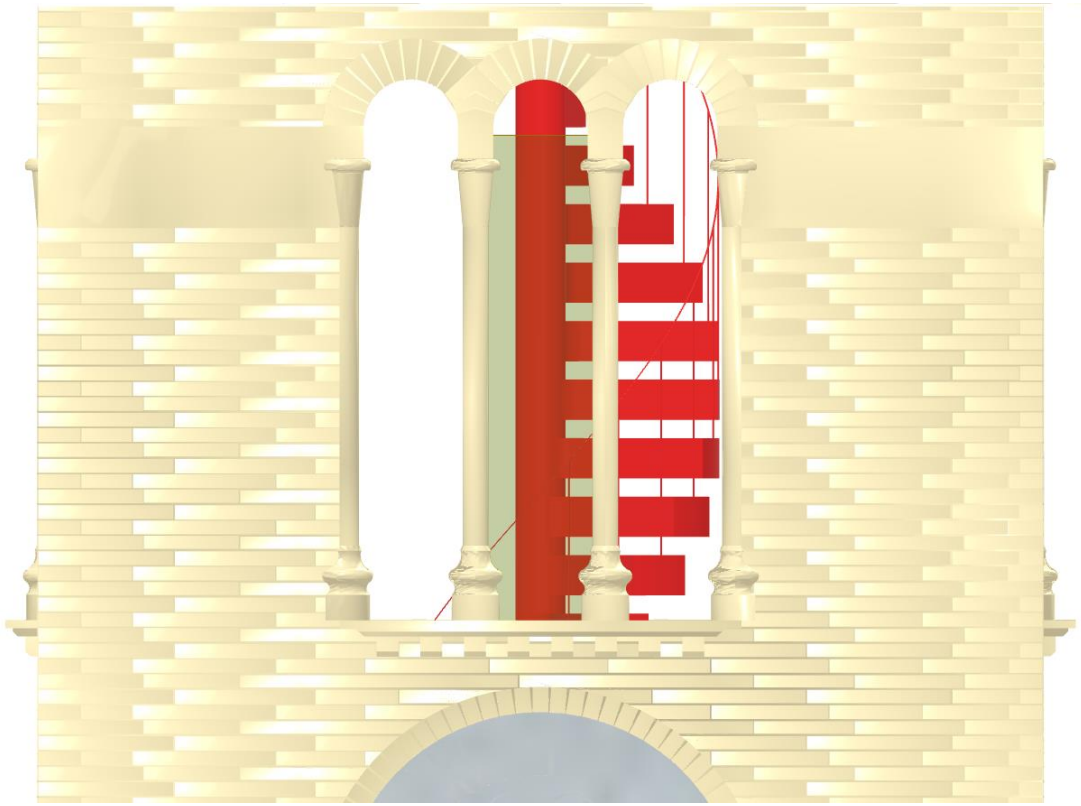


3D Extrusion: Staircase + Tower



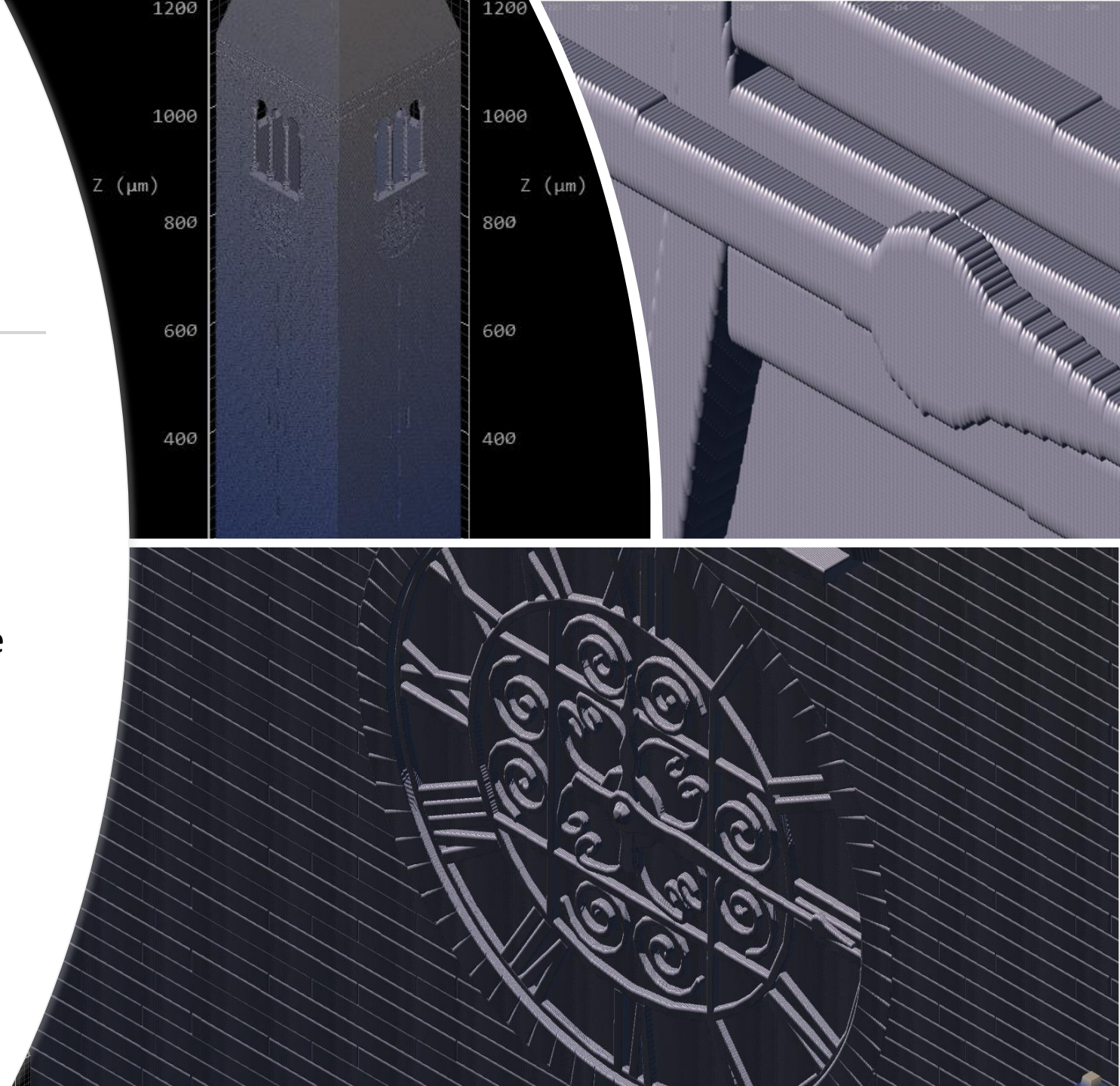


3D Extrusion: Final Assembly



NanoScribe

- From the Tower Assembly an STL file was generated
- This STL file was then loaded into NanoScribe's DeScribe
- Using the 25x objective with IP-S resist the model on the right was generated.

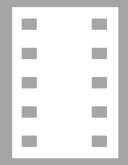


Future Work

The Bells and other structure need to be added.

A new model will be created for the NanoScribe.

63x objective with IP-Dip



Print an array of Clock towers to create a gif or movie

Here are some picture of Cats!

Cello

Sunday

Thank You!