The Sundial Project: 3D Modeling and 3D Printing

Joseph O'Rourke, Rachel Axtell '12, Alex Cheng '11, Rebecca Mackley '12, Gillian Riggs '10, Kaitlin Somers '12, Angela Zhu '11, Ruby Zucker '12

A sundial was designed and donated to Smith by the Class of 1883. It stood on a pedestal at the center of the peacock bench on Green Street (see Campus Map to right). The bench remains, but the original sundial was long ago lost and replaced by a generic sundial (which is also now gone). All that remains of the original is one photo (right) and a rubbing, which senior Makana Hirose converted to the drawing (at left). She and David Dempsey from the Art Museum are creating a mold to recast the sundial following the original design, which includes six phoenixes, Celtic knots, and Greek words. In parallel to the conventional molding technique, we are using Smith's 3D printers to recreate the sundial. Which will be used for the final casting is as yet unclear.

Our process consists of modeling portions of the sundial in two 3D modeling software systems, SolidWorks and Blender. We then merge the designs into one, and print the shapes on Smith's Z-corp 3D printer, located in the Design Fabrication Center. We have not yet printed the full design. The images below show our partial results.
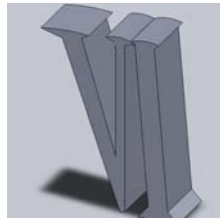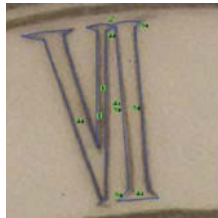

Makana's drawing based on the rubbing.

Plasticine mold in Art Museum.

The only photo of the original.
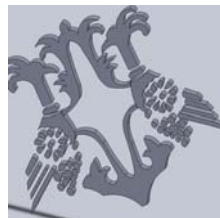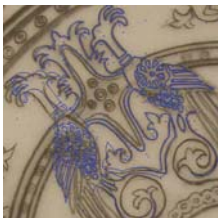

Location of phoenix bench and sundial.

SolidWorks

Modeling just one of the Roman numerals: 2D (left) and 3D extruded (right)

Celtic knots: 2D design, and extruded into 3D. Makana's drawing is in the background.

Experimental design of a pair of phoenixes, modeled by circular arcs. Replaced by Blender version in final design.

Blender

One phoenix, modeled in 2D by Bezier curves, and extruded into 3D.

Ornamental leaves in 2D and rendered in 3D.

Merge of SolidWorks and Blender designs for central disk.

3D Printing

Z-print software, loading an early Blender model.

Closeup of screen, Blender design.

Print head binding powder in layer of SolidWorks design.

Brushing off excess powder from SolidWorks design.

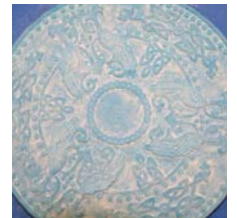Depowdered SolidWorks design.

Several partial prints together.

Closeup of screen, merged design.

Brushing off excess powder from merged design.

Depowdered merged design.