



Parametric Ring Designs for Lost Wax Casting

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CS 491 COMPUTATIONAL FABRICATION, FALL 2023

Project Goals

- CREATE A PARAMETRIC SETUP THAT CAN ACCEPT MULTIPLE RING SIZES
- PRINT A SOLID 3D MODEL IN CASTABLE WAX RESIN
- CAST IN BRONZE



Grasshopper

Model rings
Model setting
Arrange models around axis



Fabricate

Print test model
Cast



Grasshopper

Make adjustments based on tests
Voronoi modeling
Adjust sprue packing



Fabricate

Print models
Cast models



Finalize

Clean models
Documentation

Timeline

Modeling

Metahopper > Hops

- ▶ Break out:
 - Band design
 - Setting design

Manufacturing Limitations

- ▶ Volume of model
- ▶ Weight
- ▶ Flask size

PARAMETRIC SETTINGS

OUTPUT

- 0
- 0.5
- 1
- 1.5
- 2
- 2.5
- 3
- 3.5
- 4
- 4.5
- ✓ 5
- ✓ 6
- ✓ 7
- 7.5
- ✓ 8
- ✓ 8.5
- ✓ 9
- ✓ 9.5
- ✓ 10
- 10.5
- ✓ 11
- ✓ 11.5
- ✓ 12
- ✓ 12.5
- ✓ 13
- 13.5

US Ring Sizes

Casting Metal Rio Grande: Ancient Bronze

Flask Size 4 by 6 in.

Band

Band Height (mm) 5.00

Band Thickness 18g

Recommended: 18 to 8 g

Setting

Setting Style Bezel

stone x (mm) 10.00

stone y (mm) 10.00

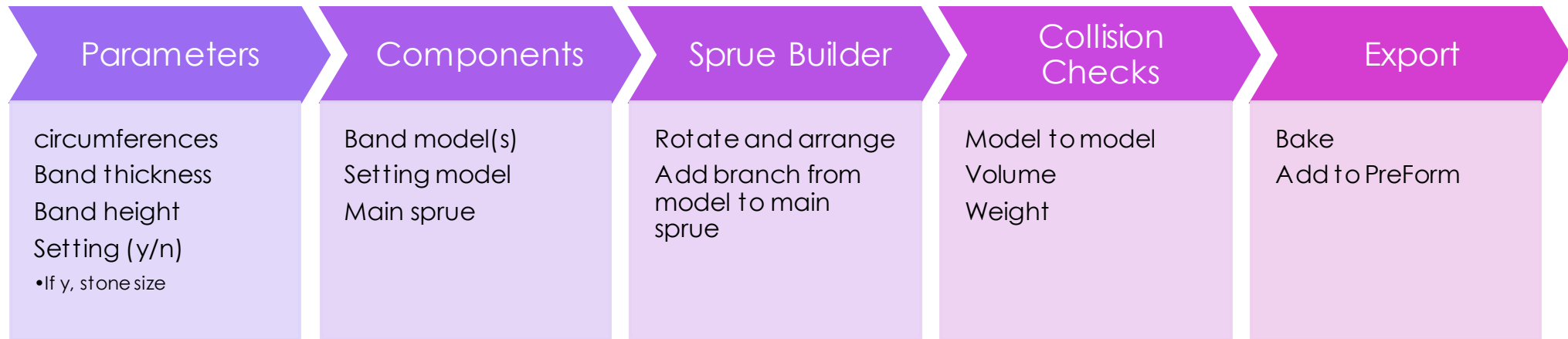
Mesh

| Collision Flags | | (0;0) |
|-----------------|-------|---------|
| 0 | False | |
| 1 | False | |
| | | (0;0;0) |
| 0 | False | |
| 1 | False | |
| 2 | False | |
| 3 | False | |
| 4 | False | |
| 5 | False | |
| 6 | False | |
| 7 | False | |
| 8 | False | |

Charge Needed (0)
0 53.826202

Remaining Weight (0)
0 946.173798

Est. Cost (in bronze) (0)
0 2.153048



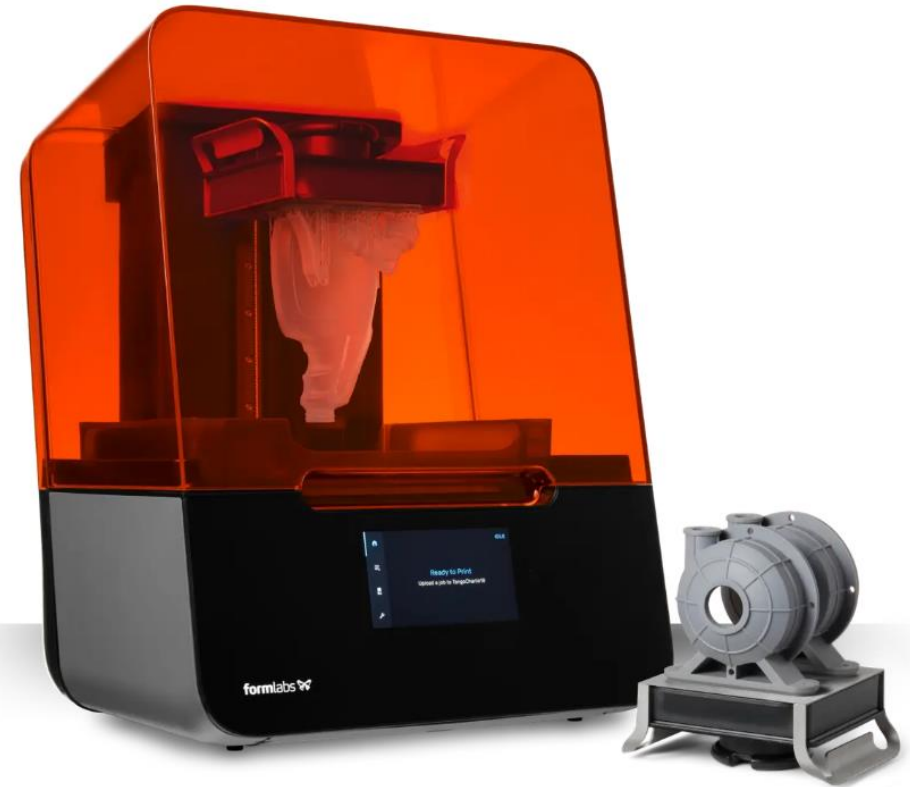
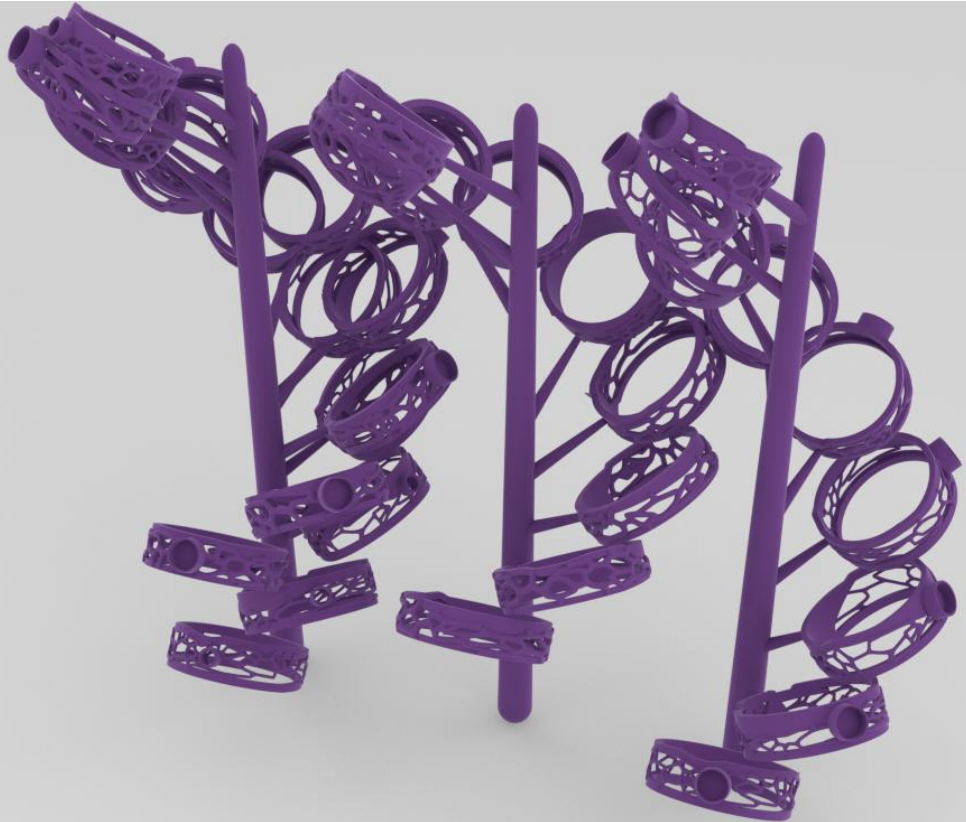
Workflow

Fabrication

SLA printer

Metal casting

Printing



Casting: Preparation

Prepare

- Secure sprue to base

Calculate charge

- Weight of matrix X specific gravity of metal grain

Prepare flask

- Mix investment
- Pressurized to remove air

Burnout

- Removes matrix
- Cures investment
- Maintain temperature

Casting

Casting: Vacuum

Heat to casting temperature -50

Add casting grain to crucible

Wait to reach temperature

Pull flask from kiln and place in chamber

Activate vacuum, seal chamber

Remove flask

Release vacuum

Slowly raise graphite rod to release molten metal

Wait for temperature to stabilize

Cleanup

- ▶ Blow-off: removal of investment by submerging in room-temperature water
- ▶ Scrub brush to remove excess investment
- ▶ Ultrasonic bath
- ▶ Tumblers in varying coarseness
- ▶ Rough file
- ▶ Polish up through grits
- ▶ Final polish
- ▶ Seal

What Went Wrong, What to Change

- ▶ Minimum detail size
- ▶ Support removal
- ▶ Curing process
- ▶ Casting machine broke
- ▶ Support removal
- ▶ SLS printing
- ▶ Adjust sprue branch connection



Summary

► With PowerPoint, you can create presentations and share your work with others, wherever they are. Type the text you want here to get started. You can also add images, art, and videos on this template. Save to OneDrive and access your presentations from your computer, tablet, or phone.

Thank you!

FUSE Makerspace

Shannon Sweet, CNM Jewelry Lab Technician

Coffee

Tiramisu