

# Nothing is Impopsicle

*But everything is sticky.*

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2.S988 Final Presentation

Spring 2018

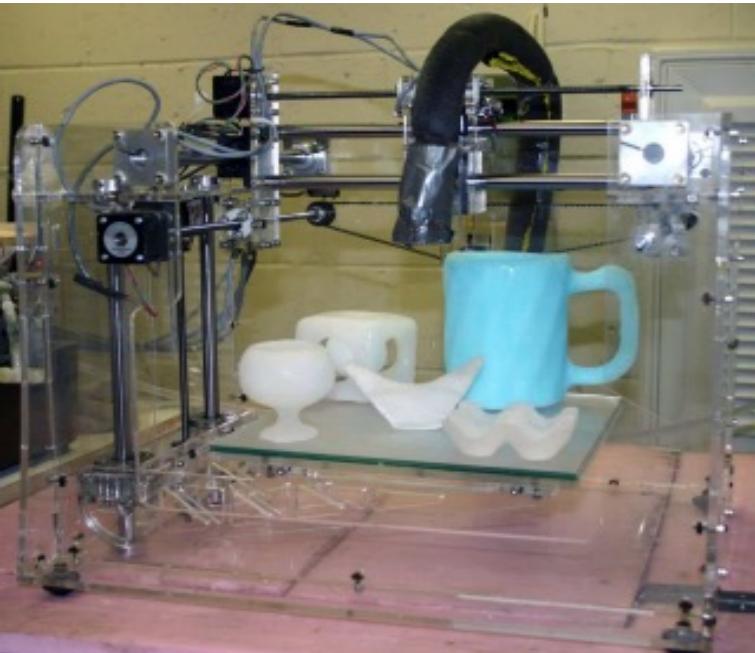
# Introduction

- Goals:
  - A do it yourself conversion of a 3D printer into a popsicle printer
  - Print edible popsicles
- Approach:
  - COTS Bed-XY printer as base
  - Custom screw drive for extrusion of slush
  - Chilled build platform to freeze slush



# Background

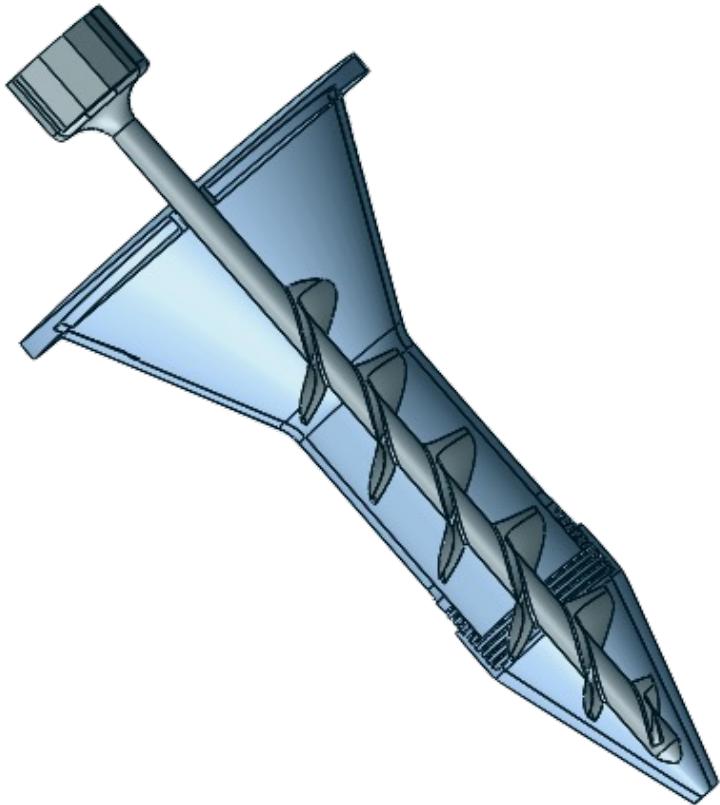
- McGill University Ice 3D Printer



- MIT Ice Cream 3D Printer



# Final Design (Extruder)



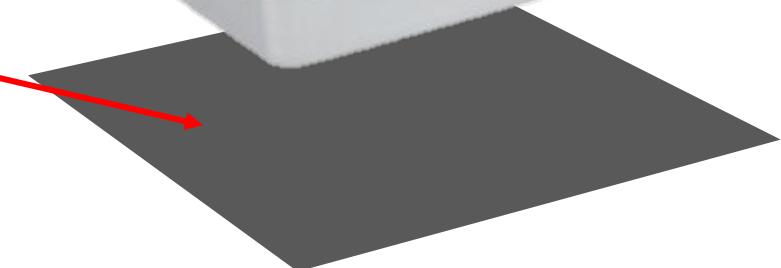
# Chilled Buildplate



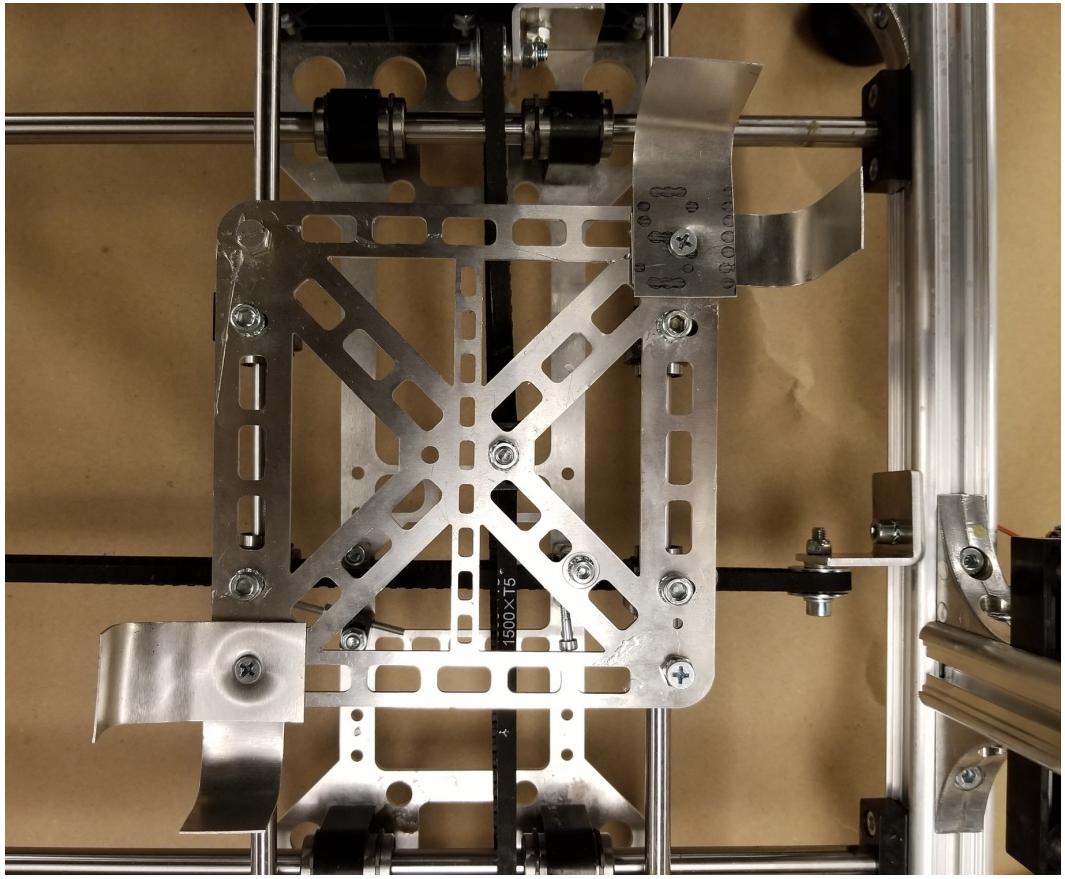
Imposicle Print Bed

Dry Ice Bath

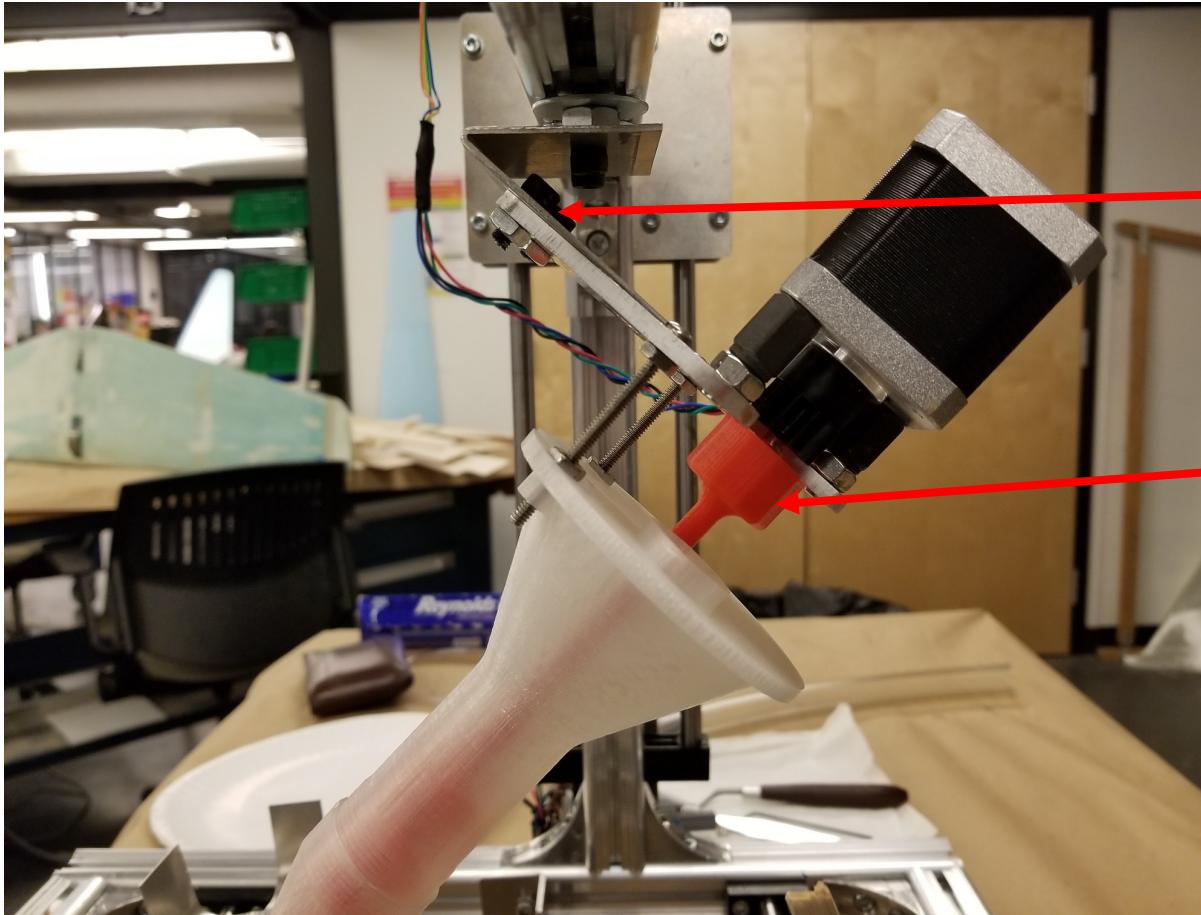
K8200 Print Bed



# Build plate attached to printer



# Angled mount for extruder

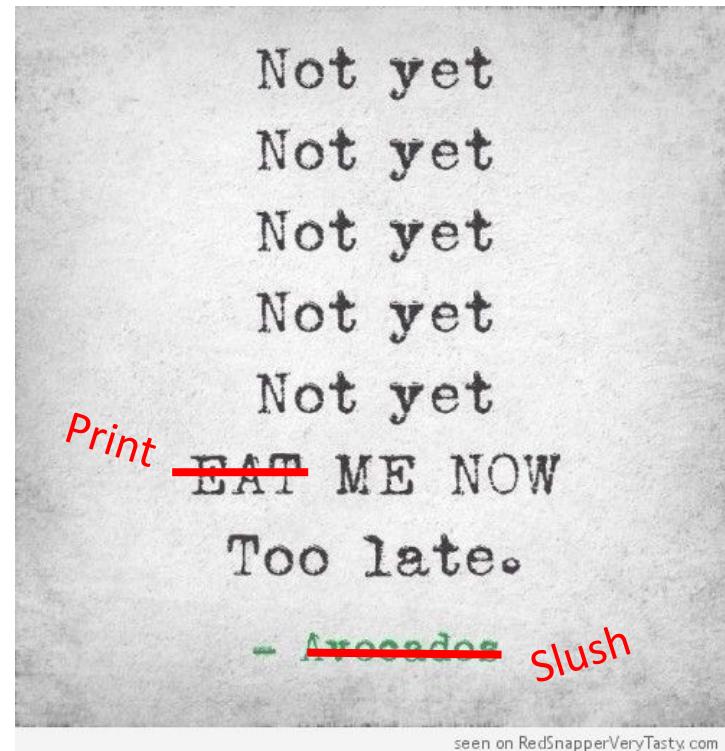


Angled bracket for  
motor mount

Motor – screw mate

# Fine Tuning

- 4 variables:
  - Printing surface temperature
  - Slush consistency
  - Nozzle diameter
  - Extrusion speed
- The first two are difficult to control



seen on RedSnapperVeryTasty.com

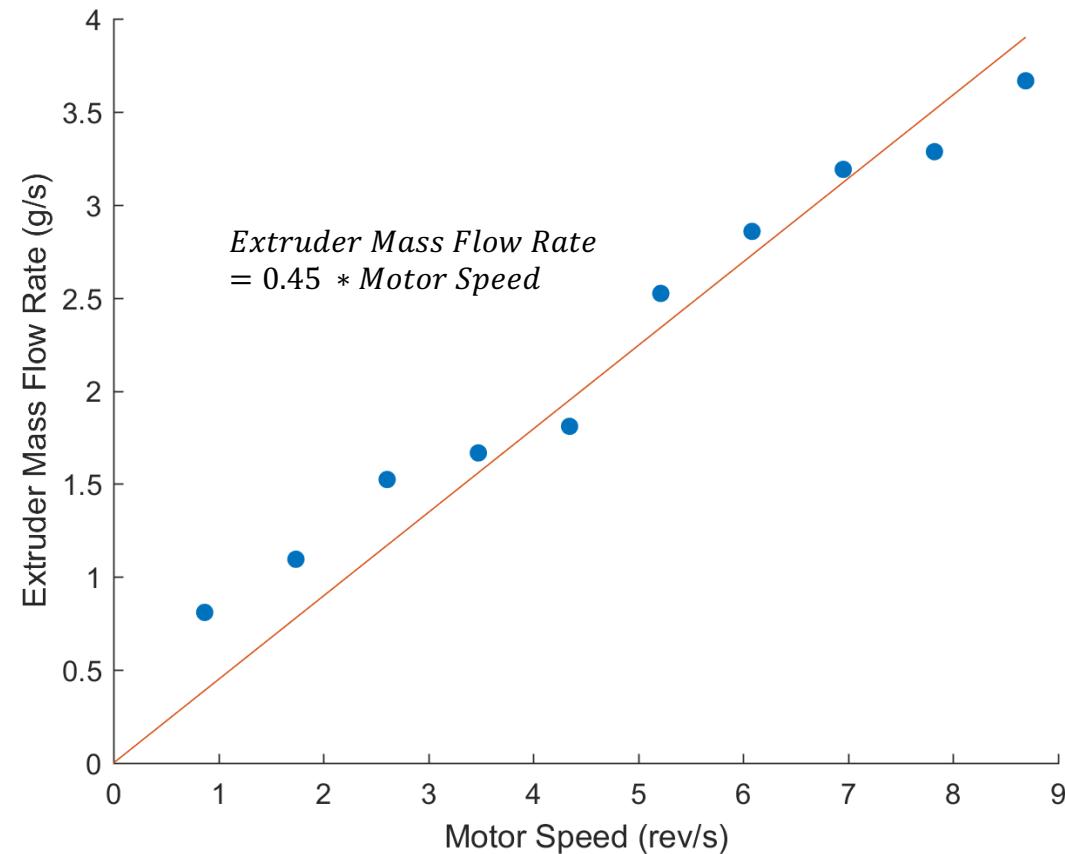


# Nozzle Diameter Selection

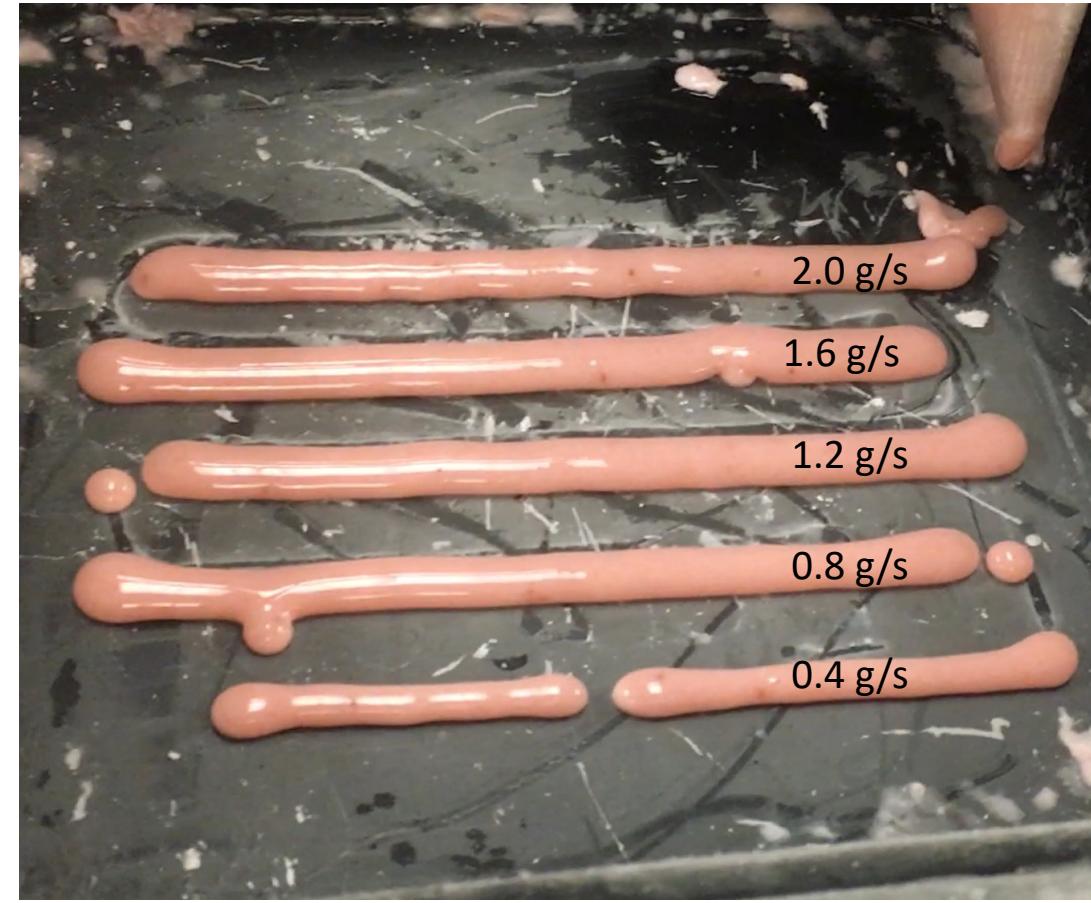
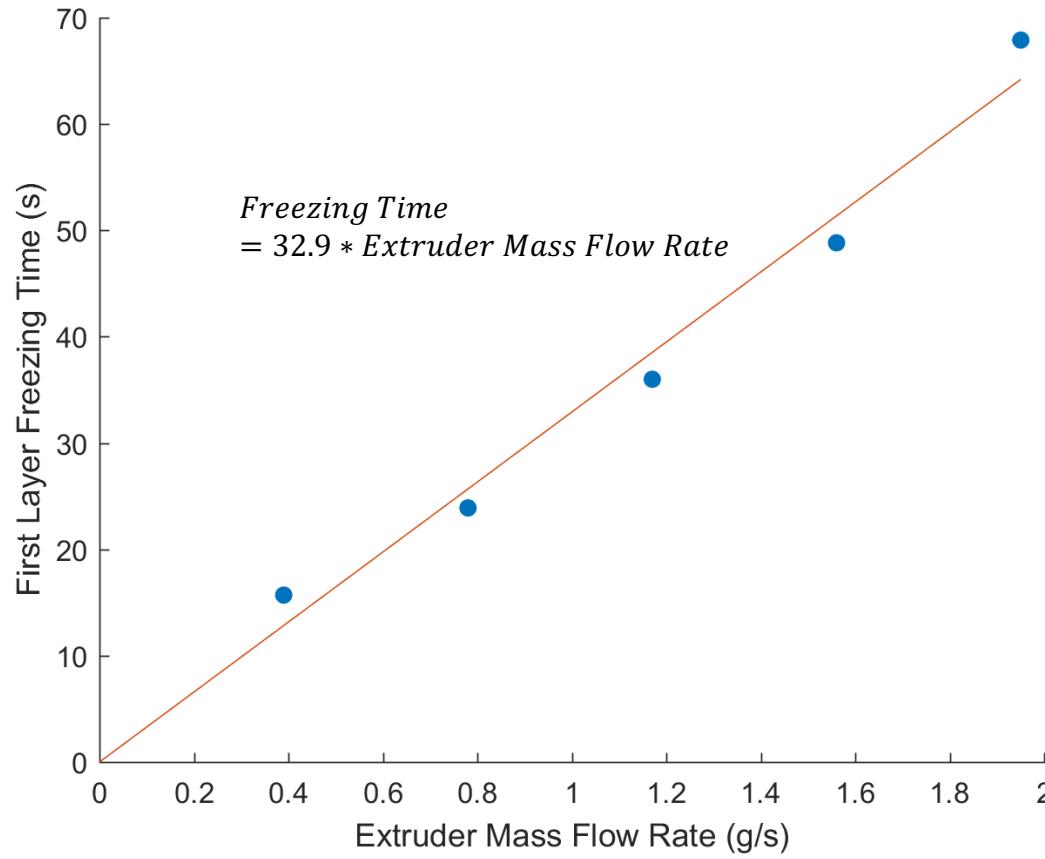
| Nozzle Diameter | Observations   |
|-----------------|--|
| 2mm             | <ul style="list-style-type: none"><li>• Extrudes inconsistently with slush</li><li>• Small ice chunks clog up the nozzle.</li></ul>  |
| 3mm             | <ul style="list-style-type: none"><li>• Extrudes consistently</li><li>• Small amount of drip</li></ul>                               |
| 4mm             | <ul style="list-style-type: none"><li>• Extrudes consistently</li><li>• More liquid slush would spread</li><li>• More drip</li></ul> |



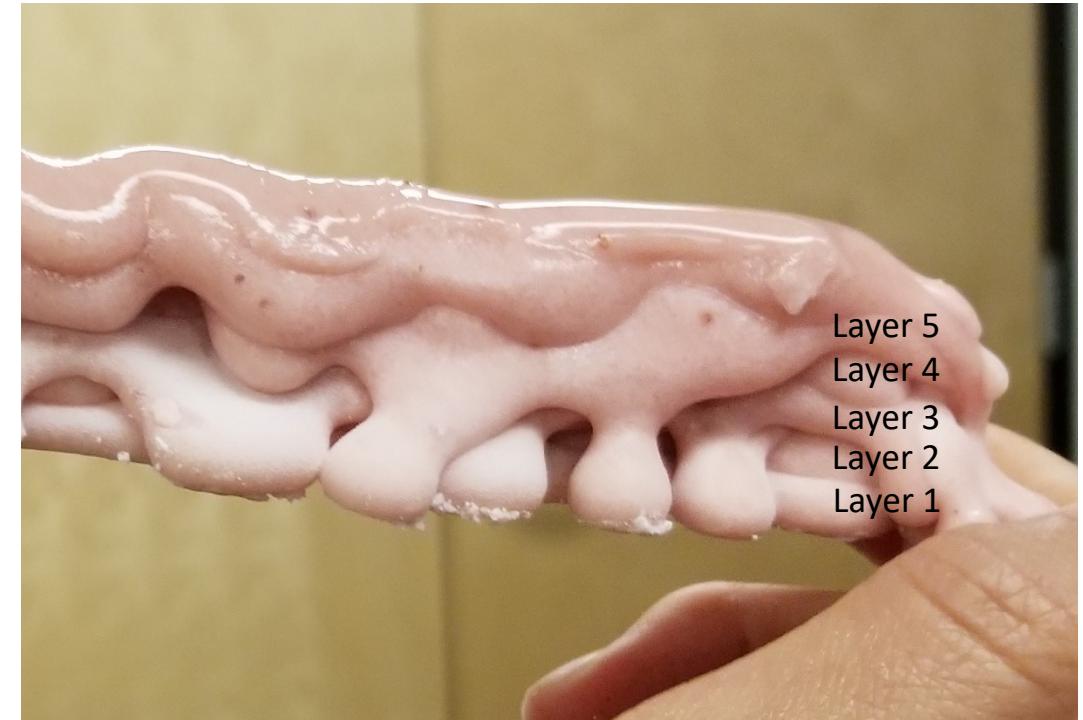
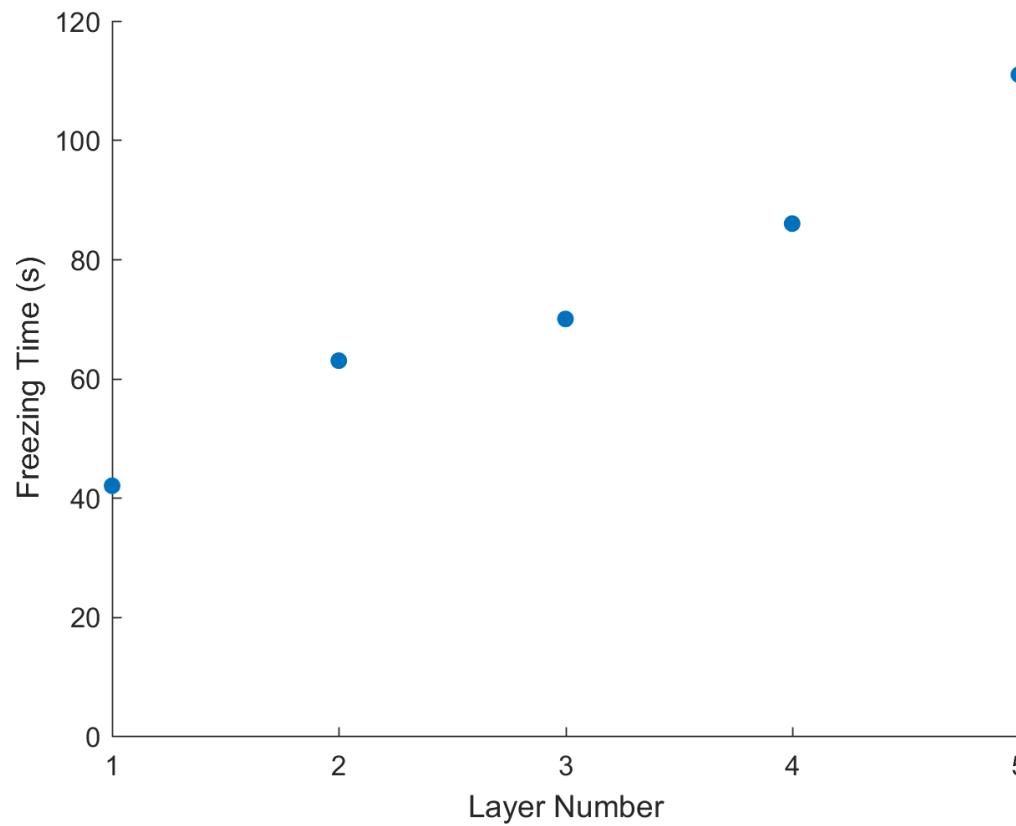
# Extruder Mass Flow Rate vs. Motor Speed



# First Layer Freezing Time vs. Extruder Mass Flow Rate



# Layer Freezing Time vs. Layer Number



- Tested at an extruder mass flow rate of 1.2 g/s



# Further Work

- Further experimentation with different raw material and with consistency control – cooled storage chamber?
- Closed circuit for the slush/smoothie to make less of a mess
- Make an opensource DIY guide to converting your FDM printer to a MPP





# Questions?

