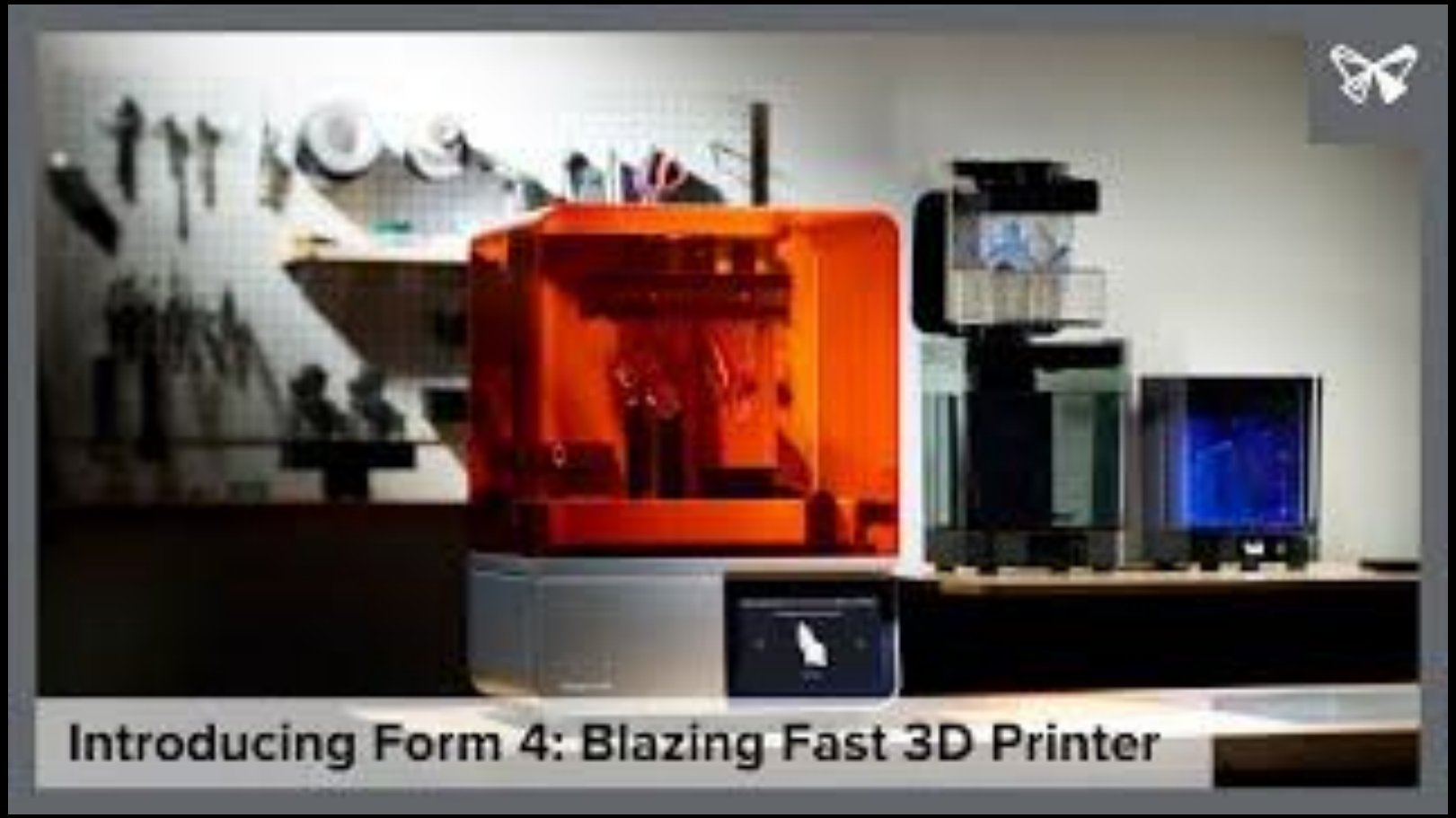
Lecture 2

3D Printing

4/18/25
Prof. Overbey
University of Austin (UATX)

Form 4 printer has arrived!


Introducing Form 4: Blazing Fast 3D Printer

Agenda

1. Tour the 3D printer and start a print test (Faculty Lounge)
2. 3D Printer Lecture (Seminar Room)
3. PreForm Accounts and Software Download (Seminar Room)
4. Wash and Cure the 3D printed test tube (Faculty Lounge)

Goal: For each student to schedule a time with me next week to demonstrate that they can operate the 3D printer.

Fundamentals of the Form 4 3D Printer

Understanding the Components and Workflow

Form 4 3D Printer

Wash Station

Curing Station

FORM 4 FORM 4L

TRAINING

HOW IT WORKS

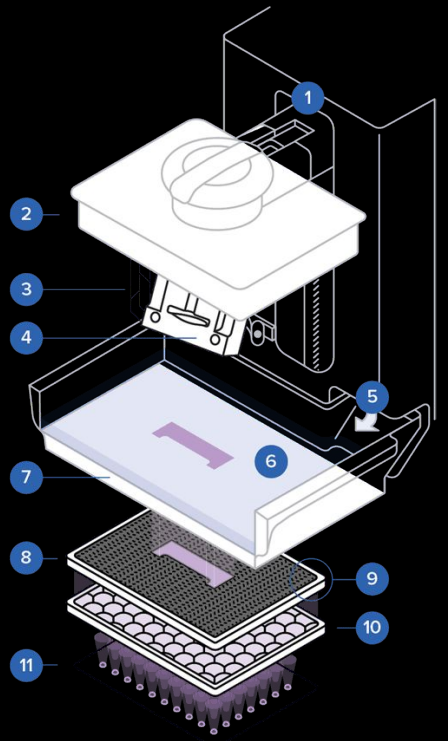
Masked Stereolithography (MSLA)

- The Form 4 utilizes MSLA technology to cure layers of liquid resin using a high-resolution LCD mask and LED backlight.

- This method allows for rapid, high-precision printing by exposing entire layers simultaneously.

Form 4 System

1. Six Control Systems
2. Build Platform
3. Supports
4. Printed Part
5. High-Speed Automatic Resin Handling
6. Resin
7. Flexible Film Resin Tank
8. Light Processing Unit 4
9. Release Texture
10. Collimating Lenses
11. LEDs



LED System

- **Light Processing Unit (LPU)**: Projects UV light through the LCD mask.
- **LCD Mask**: Displays the image of each layer, determining where resin is cured.
- **LED Backlight**: Provides a consistent and bright UV source.

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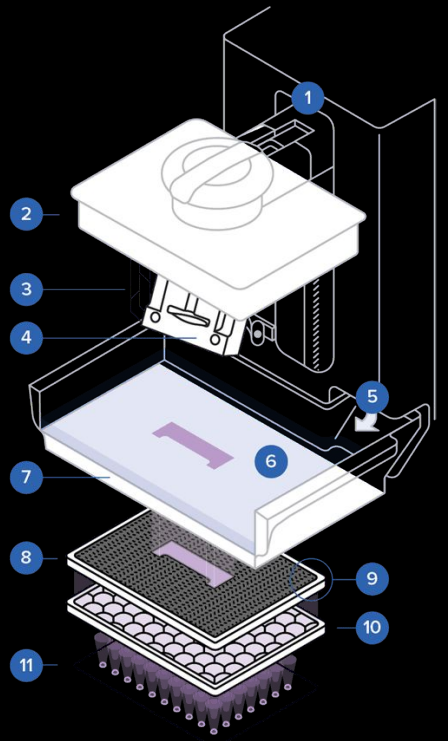

Build Platform

- Holds the part being printed.
- Moves vertically (Z-axis) to accommodate new layers.
- Removable for easy part removal post-print.

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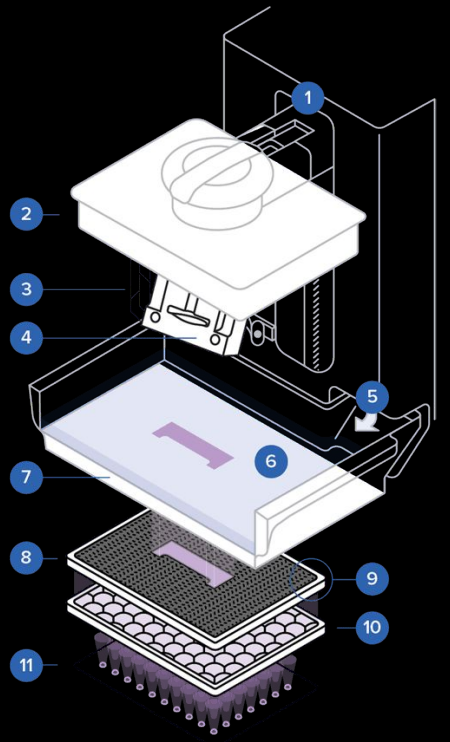

Resin System

Resin Tank:

- Transparent bottom with flexible film to enable easy layer separation.
- Durable and swappable.

Heating System:

- Maintains optimal resin temperature.
- Ensures consistent viscosity and curing quality.

Resin Cartridge:

- RFID-enabled for auto-detection of resin type and volume.
- Automatically dispenses resin into tank during printing.

Mixer/Wiper System:

- Periodically stirs the resin to ensure homogeneity.
- Prevents pigment separation and sediment buildup.

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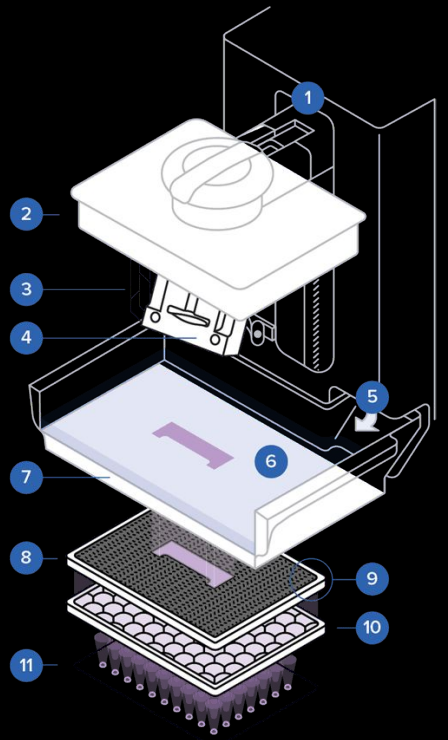


Build Process and Motion System

Z-Axis Motor:

- Moves build platform with micron-level precision.
- Smooth, quiet operation.

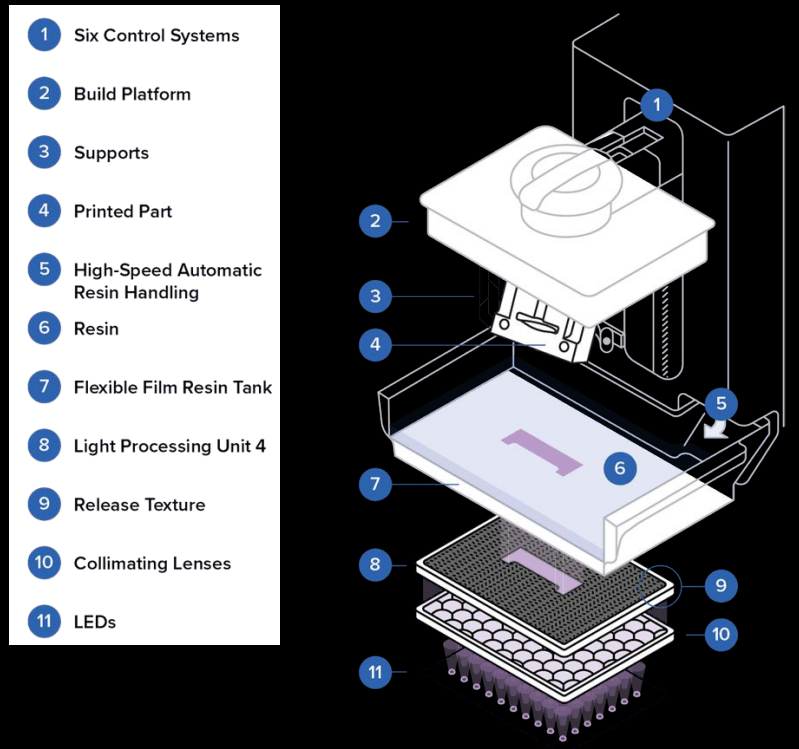
Peel Mechanism:

- Peels the cured layer from the tank film after each exposure.
- Prevents suction issues and layer shifting.

Layer-by-Layer Workflow:

1. Resin is exposed via LCD mask.
2. Platform lifts to peel the cured layer.
3. Resin redistributes and process repeats.

Form 4 System



FORM 4 FORM 4L

TRAINING

CONSUMABLE OVERVIEW

Post-Processing

Wash Station and Curing Station

Form 4 3D Printer

Wash Station

Curing Station

FORM 4 FORM 4L

TRAINING

POST PROCESS

Important!

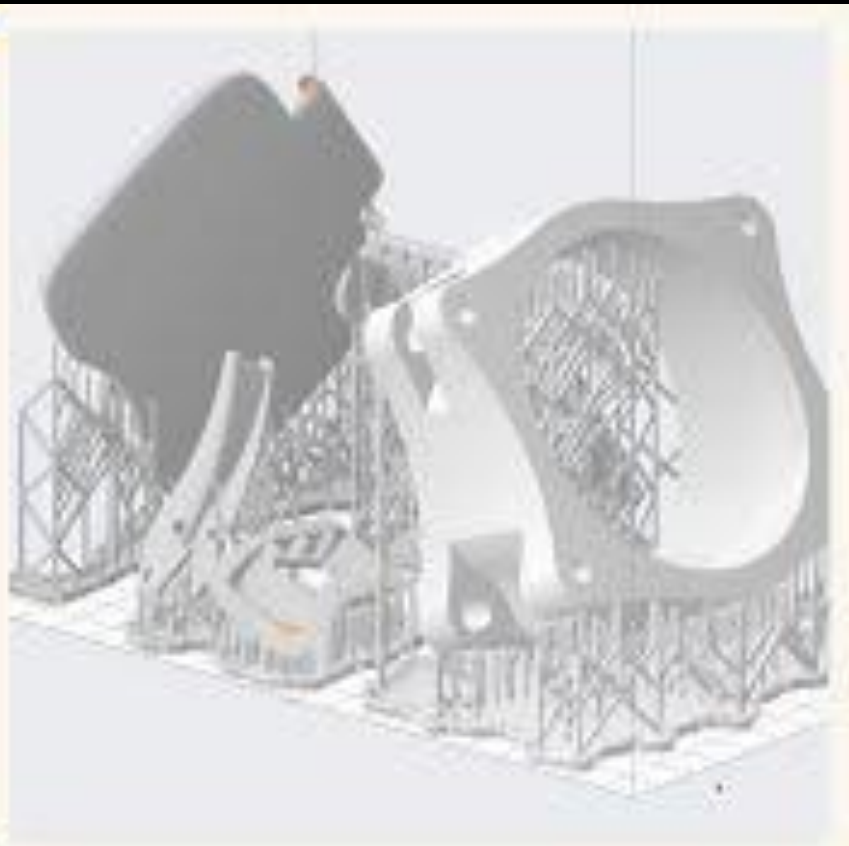
Key Safety Information

1. Wear gloves when handling 3D prints until it comes out of the curing station.
2. Keep the wash station door shut when not actively loading/unloading prints.
3. Wash your hands after using the printer, especially if skin comes in contact with resin or wash solution.

FORM 4 FORM 4L

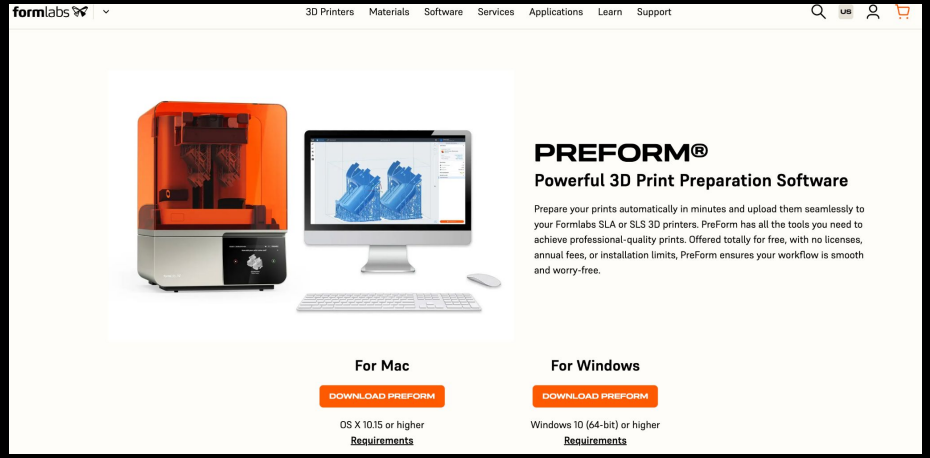
TRAINING

USING PREFORM



Pull out Laptops!

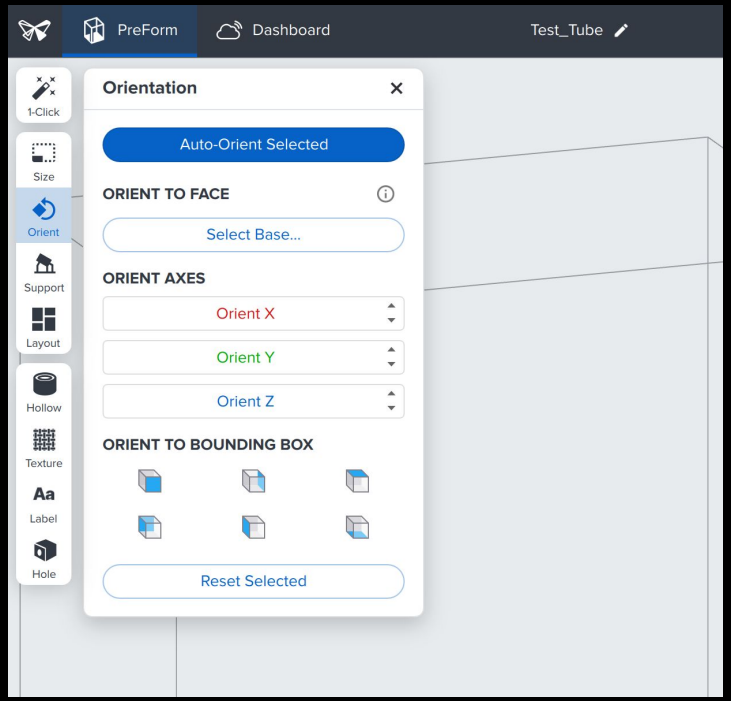
1. Download PreForm
   Google search: Preform form labs



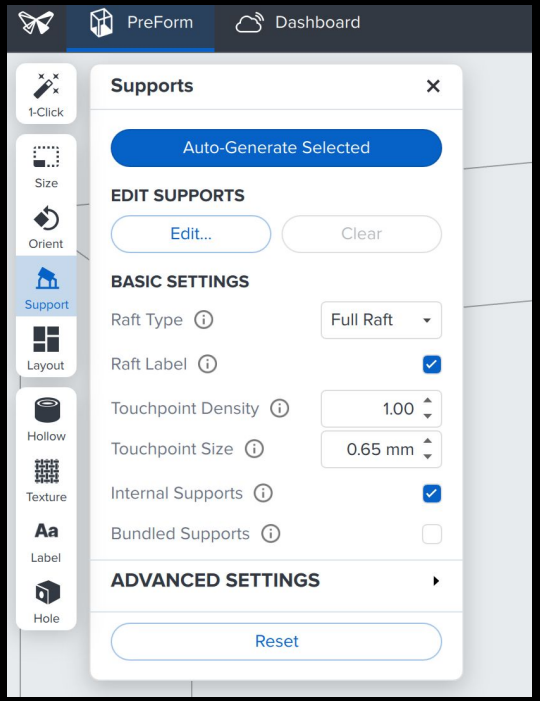
2. Load the test tube design into PreForm
   Download from course webpage:
   https://github.com/eliah-o/bioastronautics-q1

Two most important controls

“Auto-Orient Selected”



“Auto-Generate Selected”



The Test Tube Test
Next Week:
Schedule Training Meeting

- Schedule a 1-1 training with me to walk through the 3D printing process.
- You will be in the driver's seat and I will guide you.
- After you pass this training, you are approved to use the Form 4 printer solo.