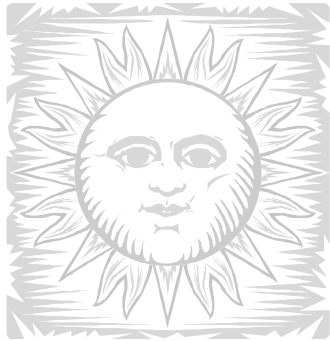
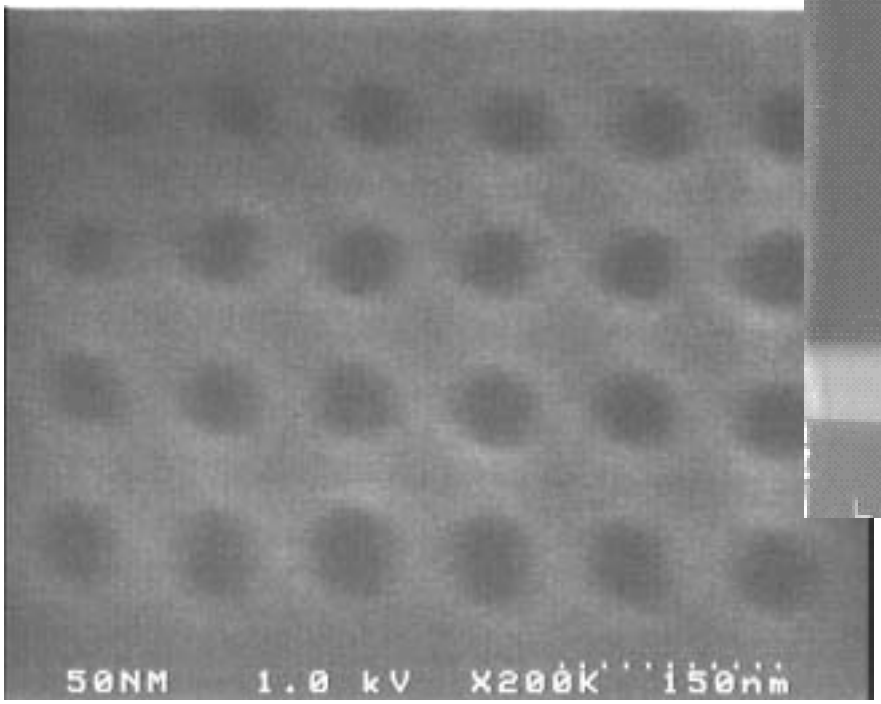
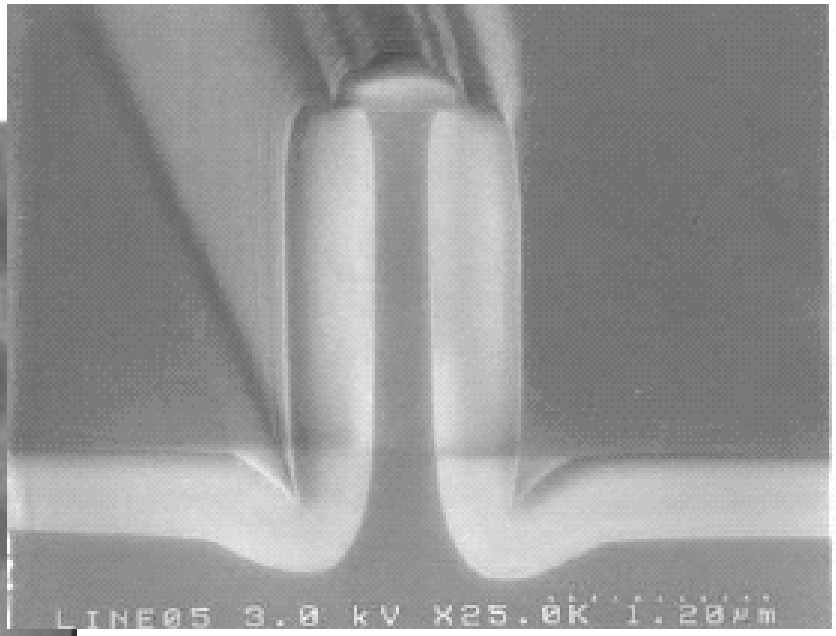
Laboratory modules for the design, fabrication and testing of microfluidic devices



How to make research discoveries approachable…

High end lithography





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Real-life

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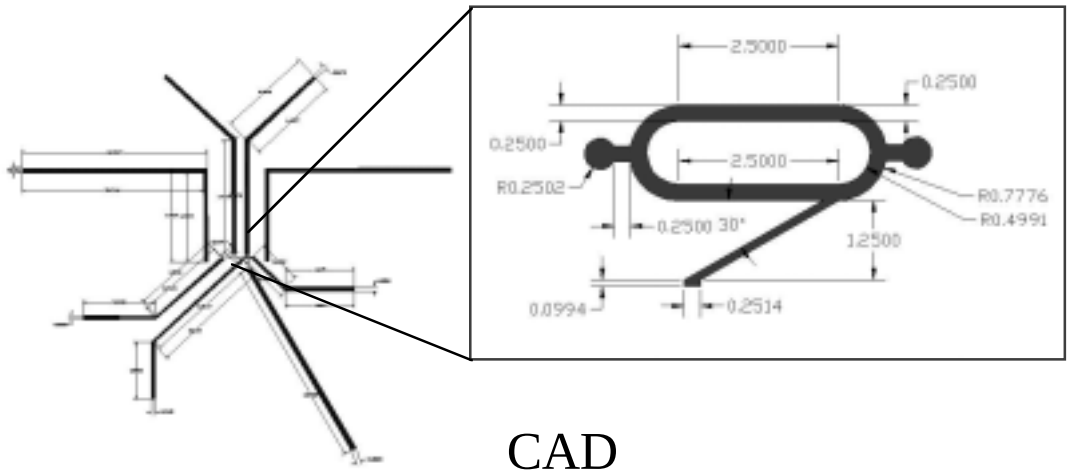
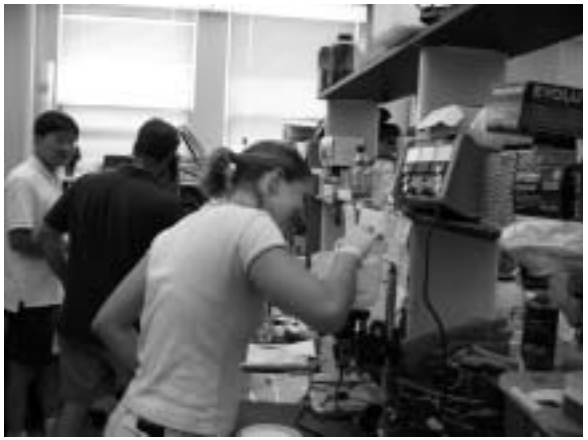
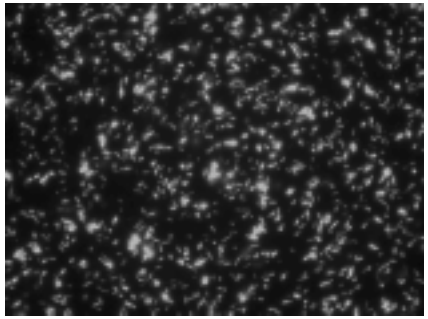
2002 High School NBTC Interns

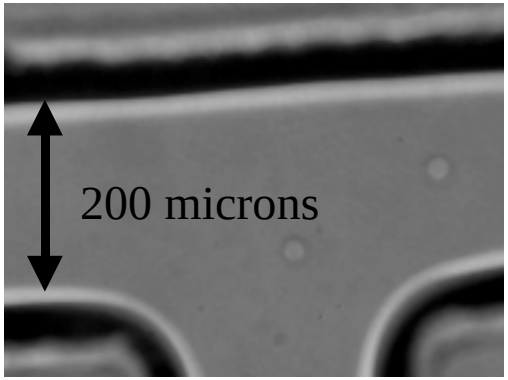


CAD





GFP-*E. coli*



Fabrication in PDMS

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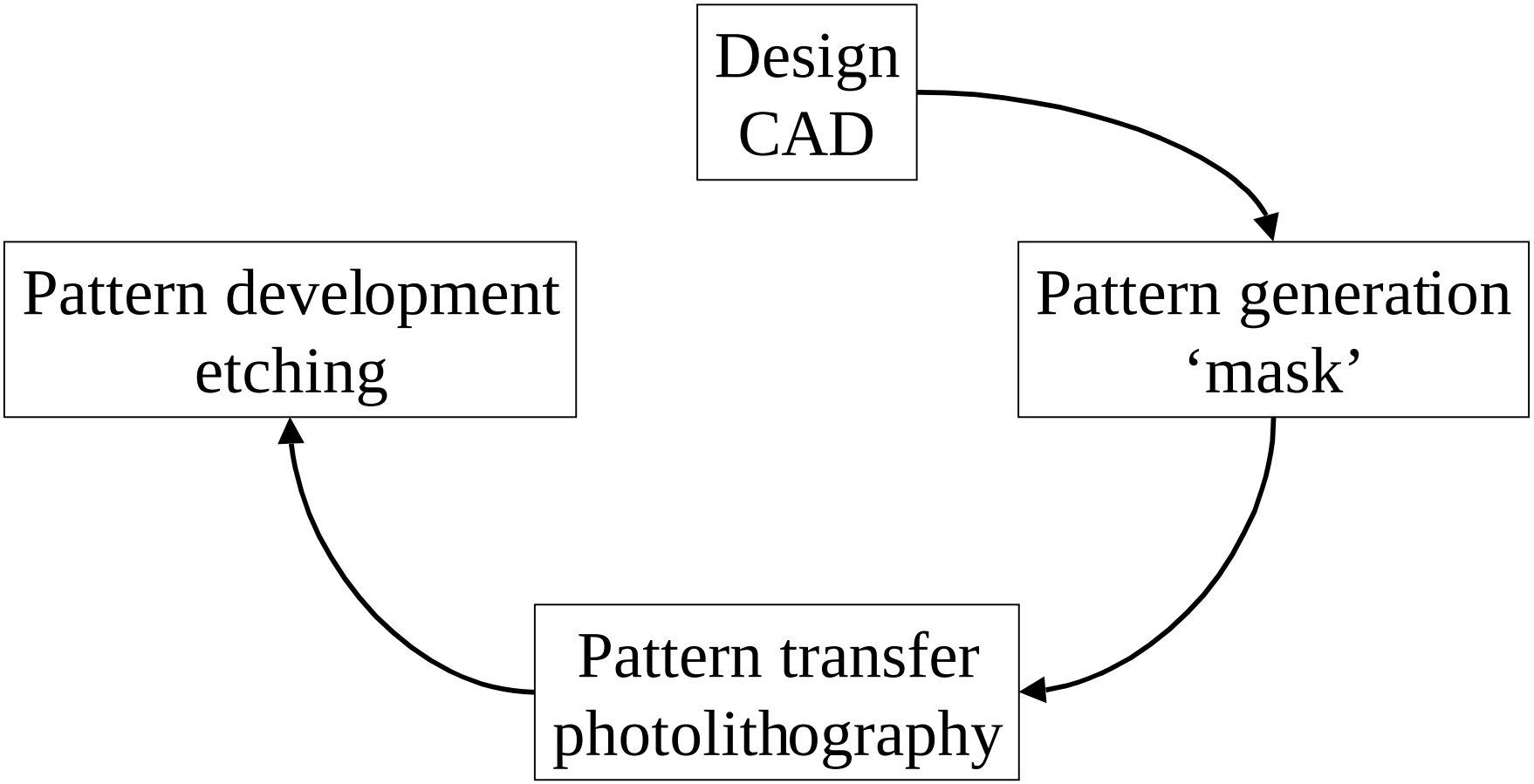
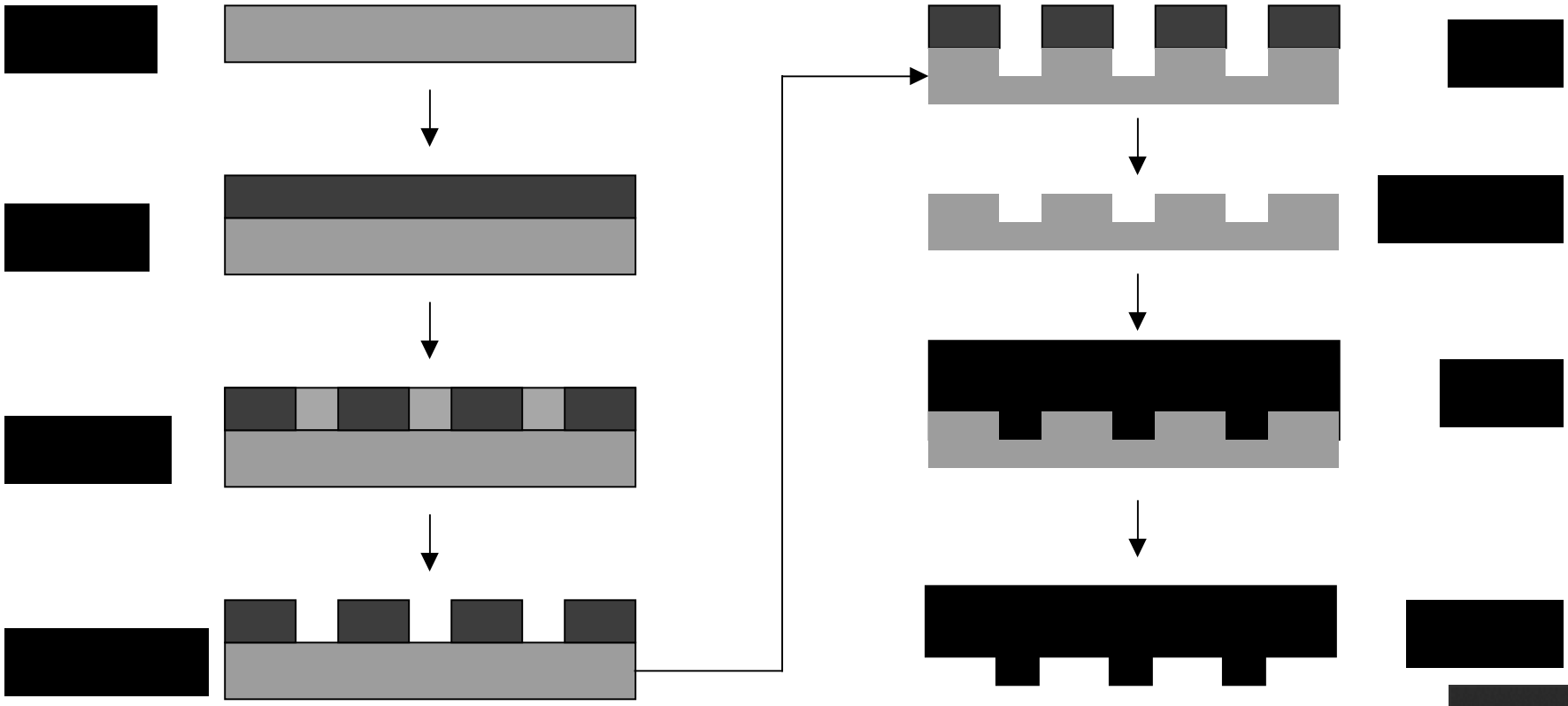
Criteria for laboratory activity

- Limited infrastructure
  - Clean rooms space limited
- Cycle time
  - Iterative design
- Safety
  - supervision
- Scalability
  - Lots of replicates

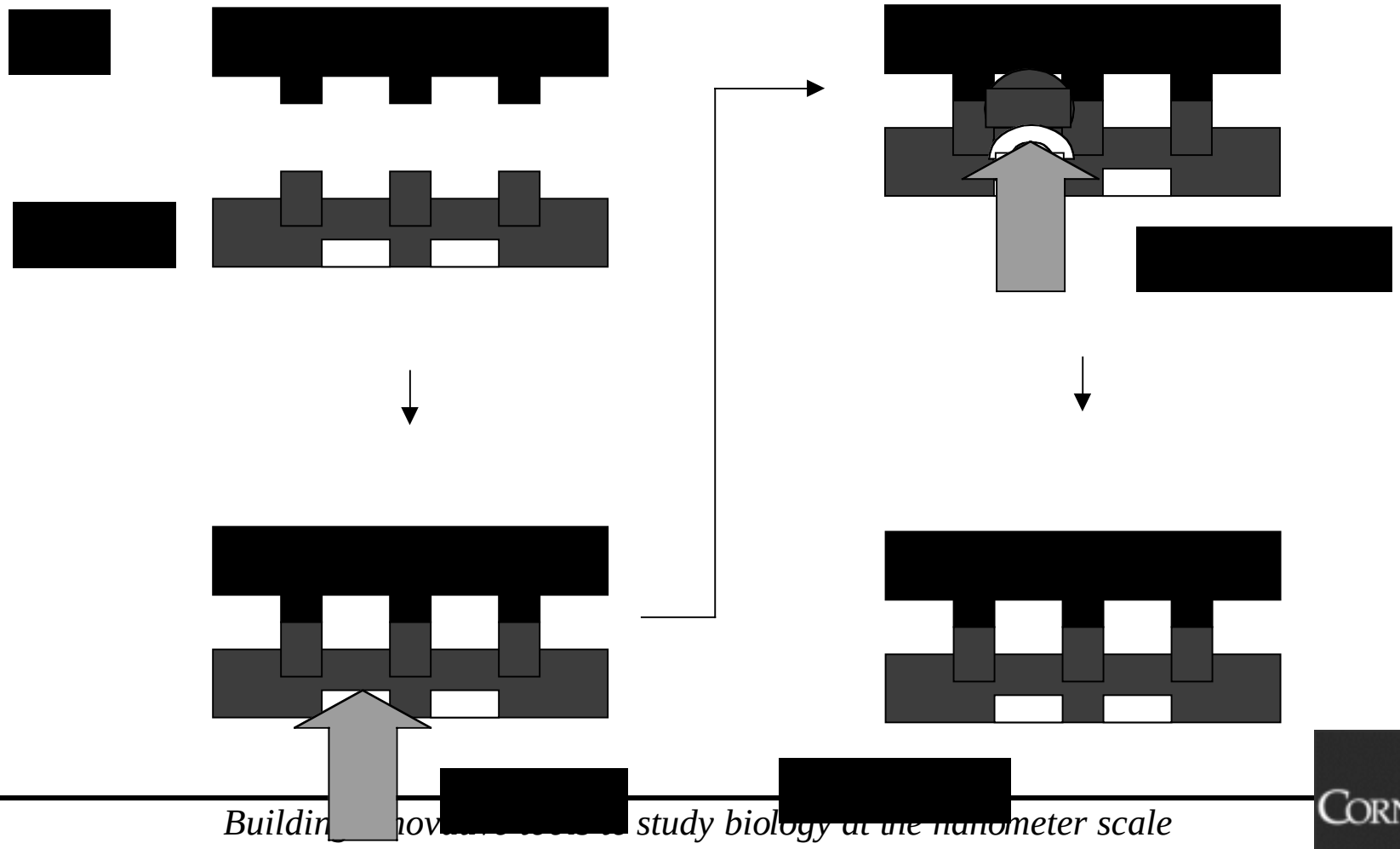
How do we make a device?



Elastomer parts



Schematic of pump/valve



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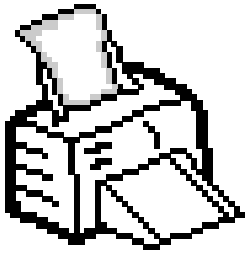
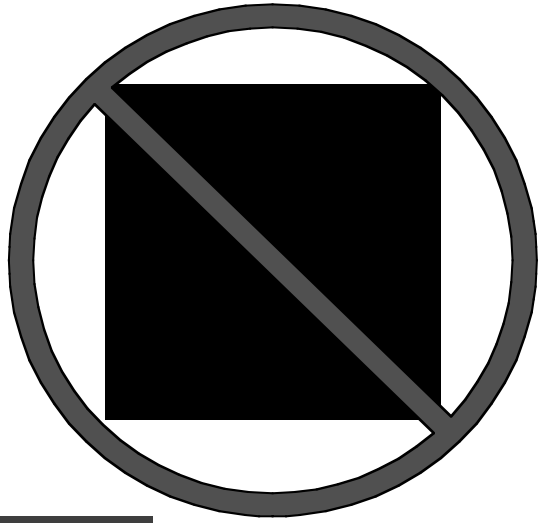
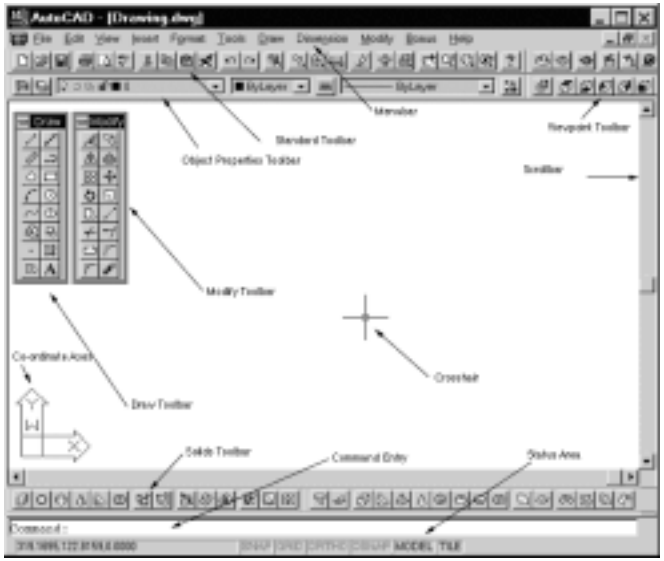
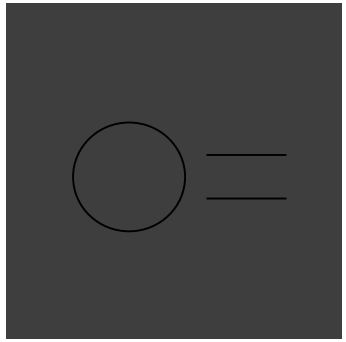
Design, mask

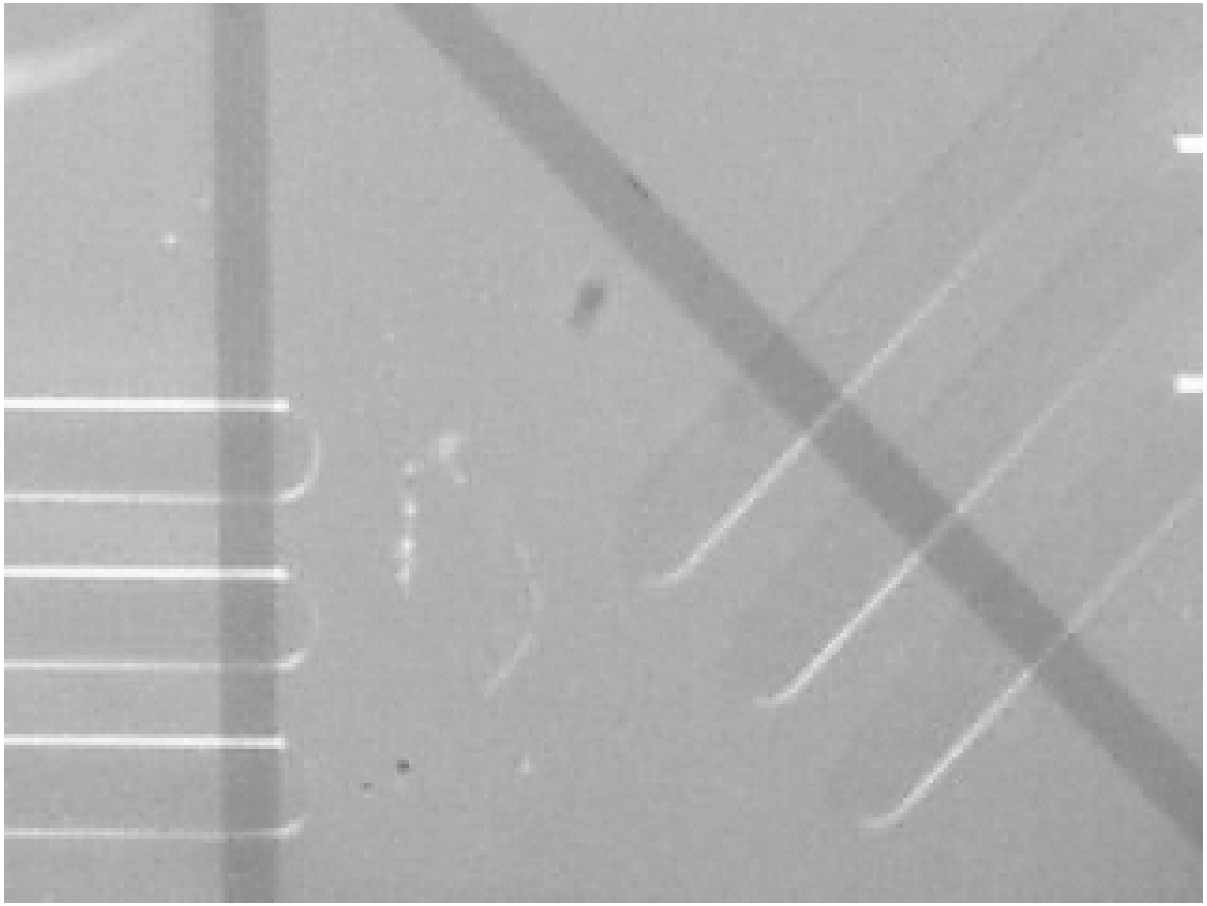




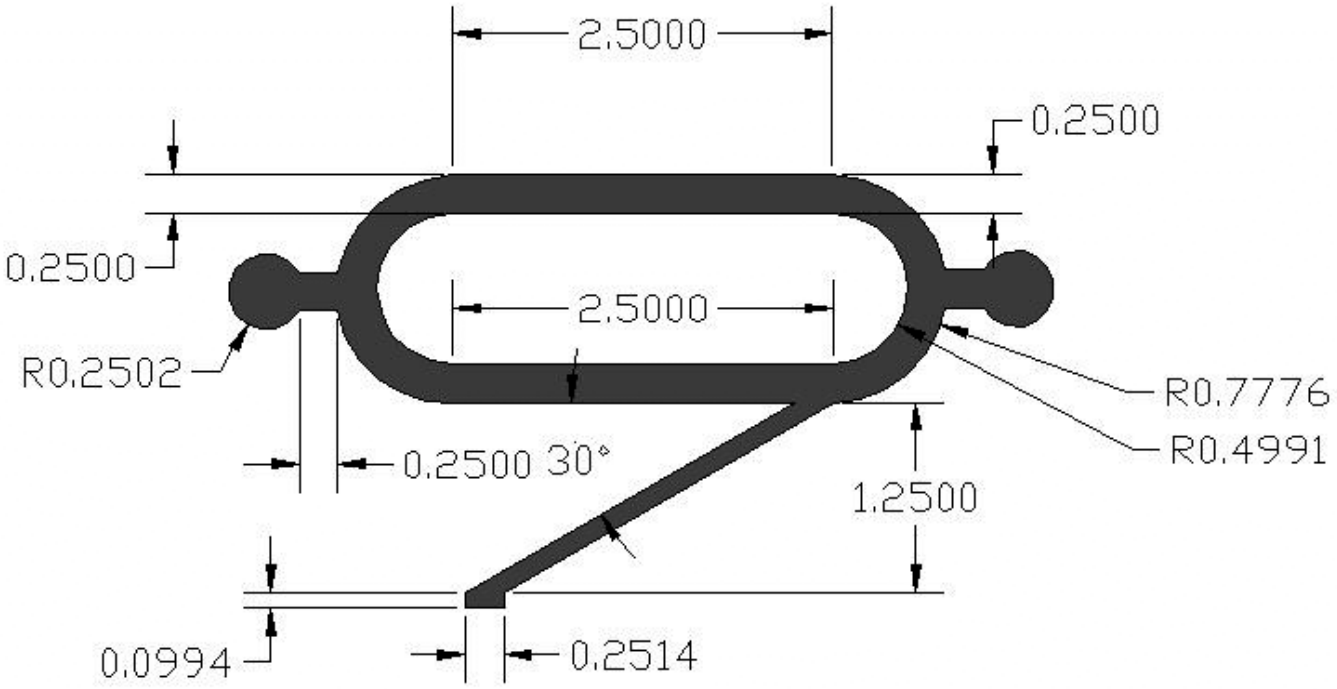

AutoCAD - [Drawing.dwg]
Menubar
Standard Toolbar
Object Properties Toolbar
Viewpoint Toolbar
Scrollbar
Modify Toolbar
Coordinate Axes
Crosshair
Draw Toolbar
Solids Toolbar
Command Entry
Status Area
Command:



Moving fluids

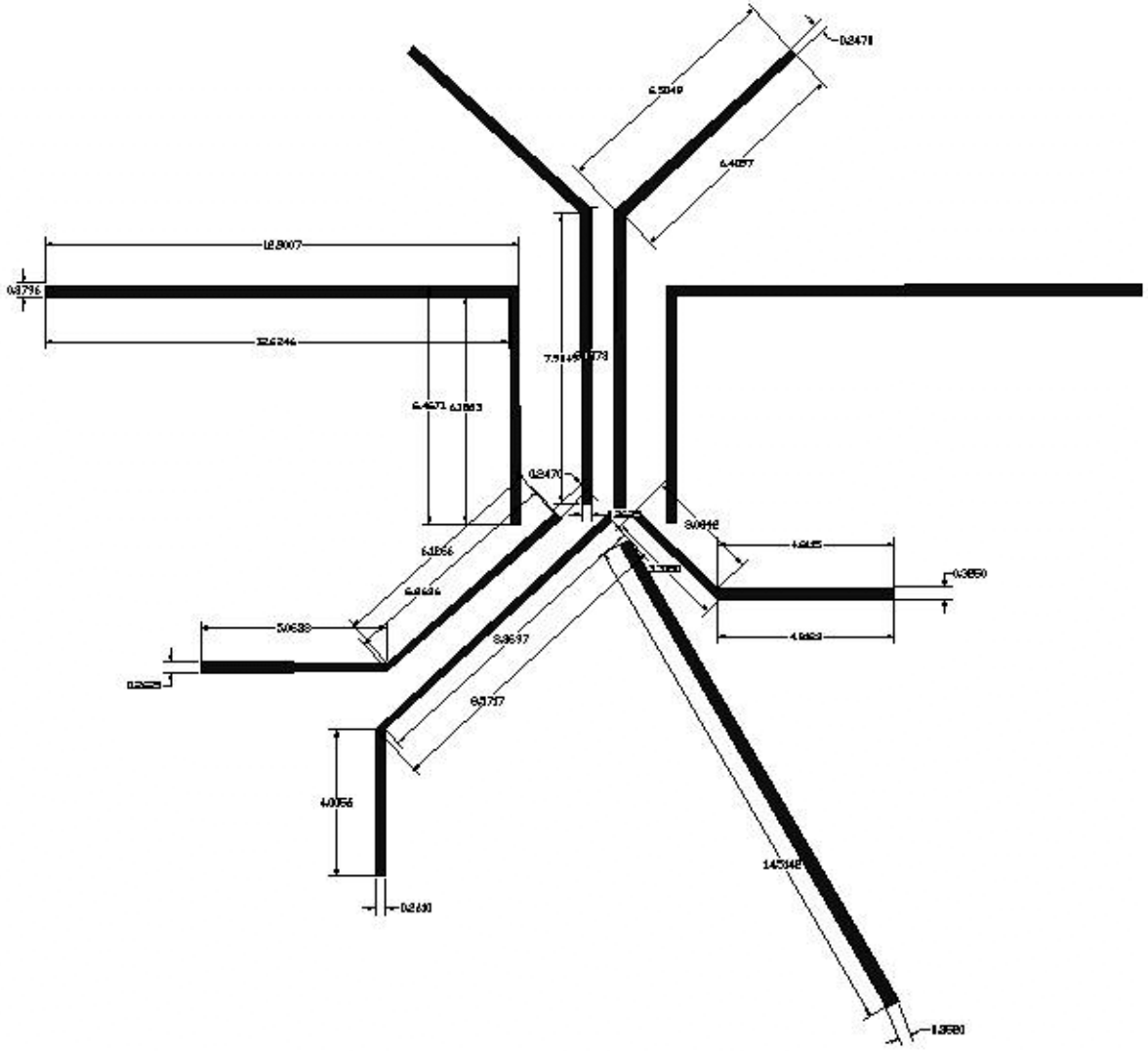


Designing the Cell Sorter



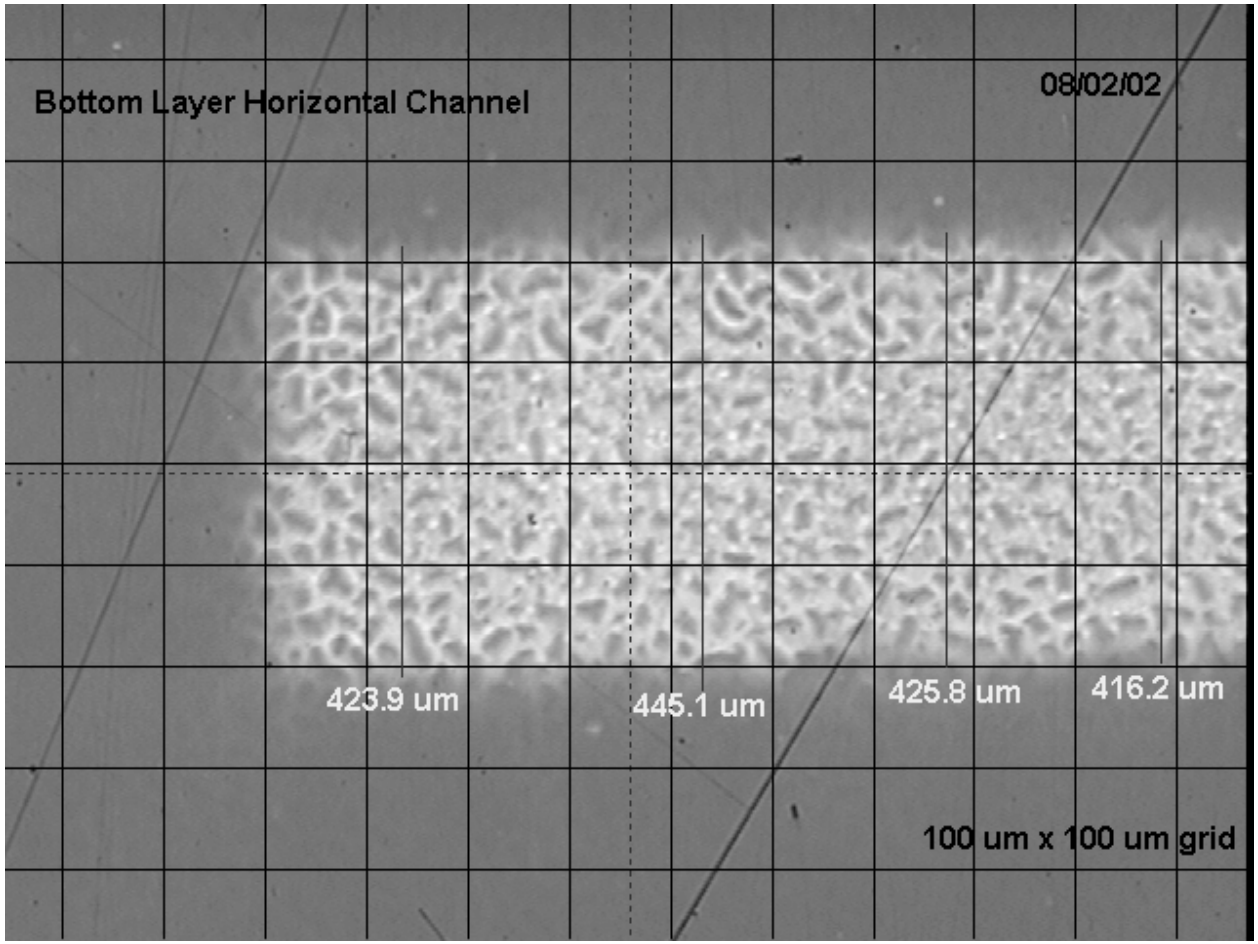
- AutoCAD design for bottom (fluidic) layer
- All measurements are in millimeters

Designing the Cell Sorter

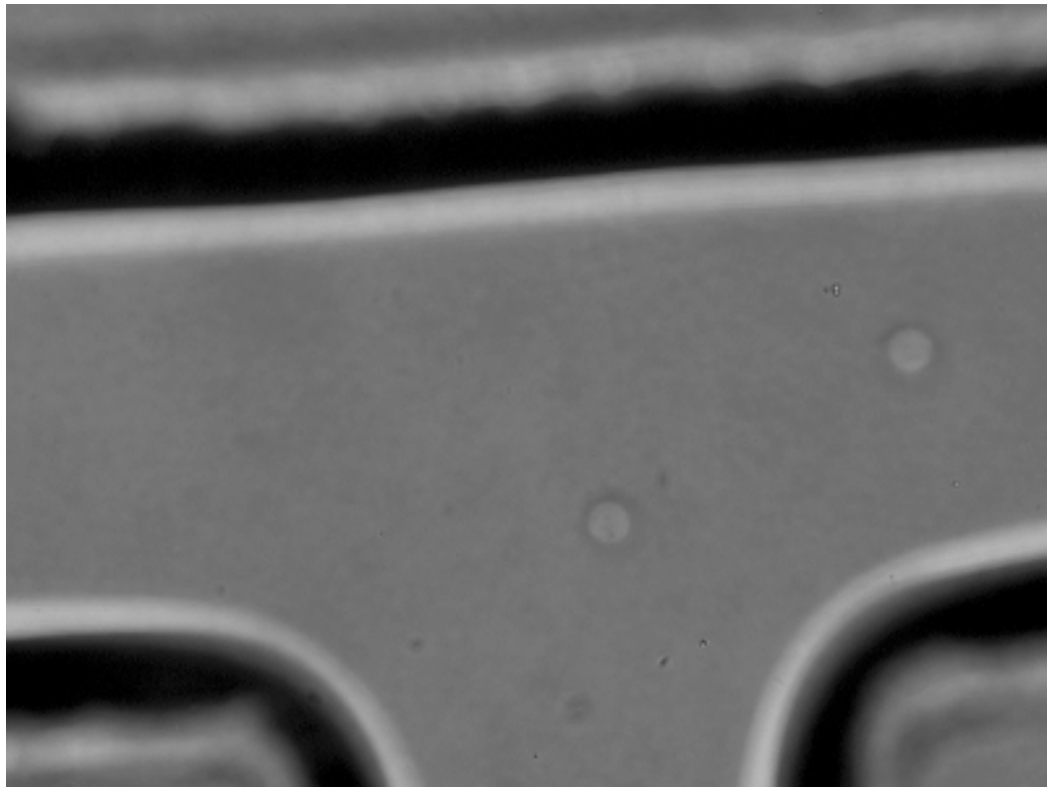


- AutoCAD design for the top (pump) layer
- All measurements are in millimeters

Mask Pictures



Device Picture



T-Canal under Fluorescence microscope

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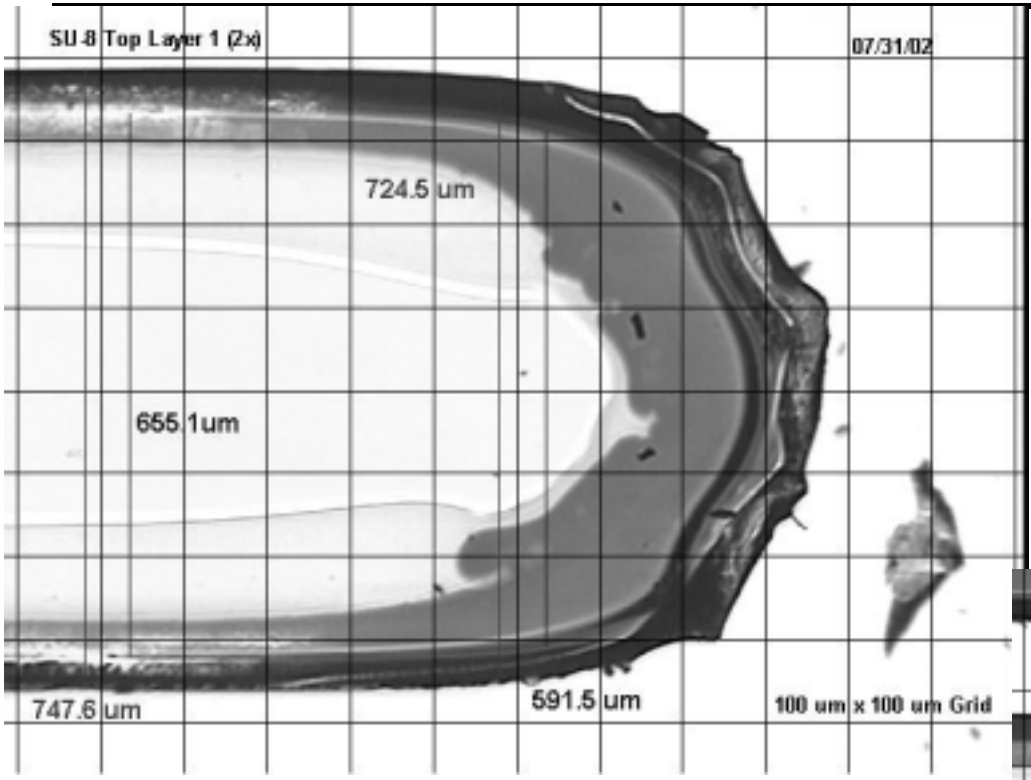
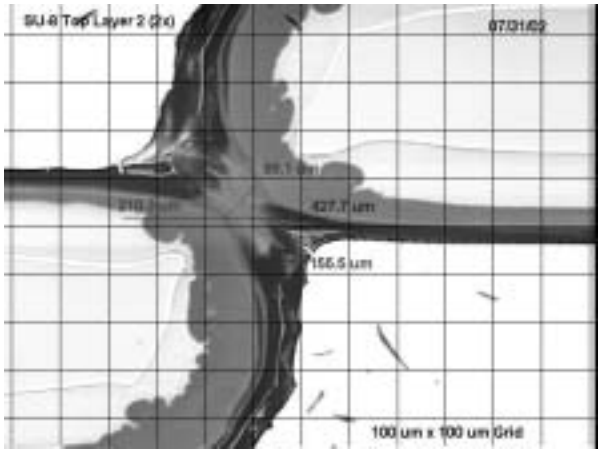
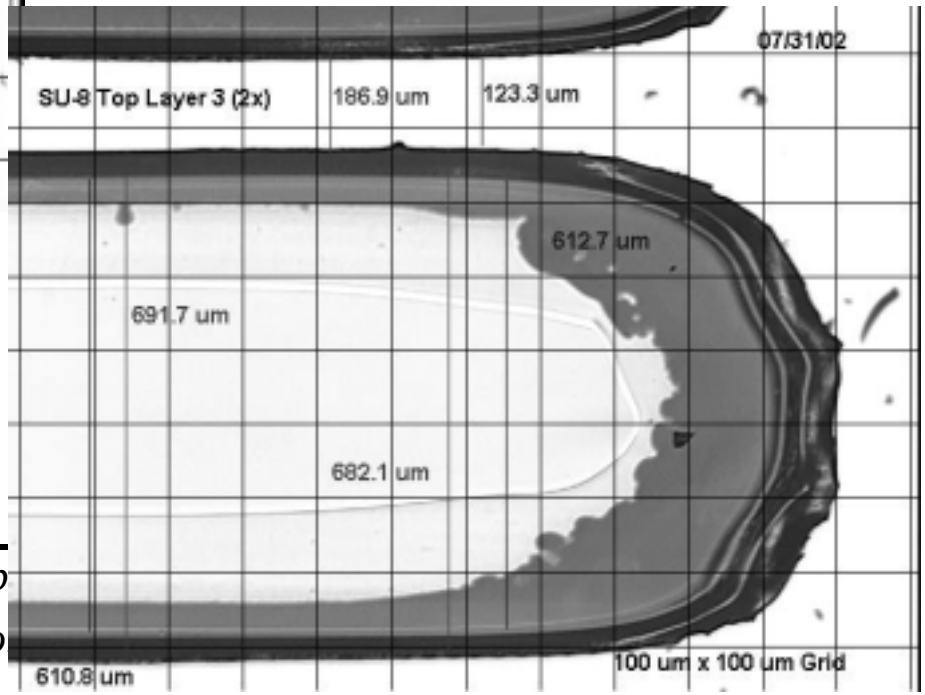
Top Layer





100 x 100 um Grid



Average Internal Measurement of Channel: 617.53 um

Average External Measurement of Channel: 711.48 um

The end

- Opportunities exist to give students real fabrication experience on a large-scale.
- Technologies for freeing students to do iterative design-build exercises.
- Little infrastructure required.
- Coupling on more theory (modeling) and ancillary component development.

Sunprinting and Photolithography

Objective: Using the concepts of photolithography, students transfer a pattern from an acetate transparency to sun paper.

Sunprinting and Photolithography

Step 1: Choose a mask. → Step 2: Using UV light, transfer the pattern to the paper. → Step 3: Develop the pattern using H_20.