Design and Testing of a Robust Platform for Nanofluidic Separations

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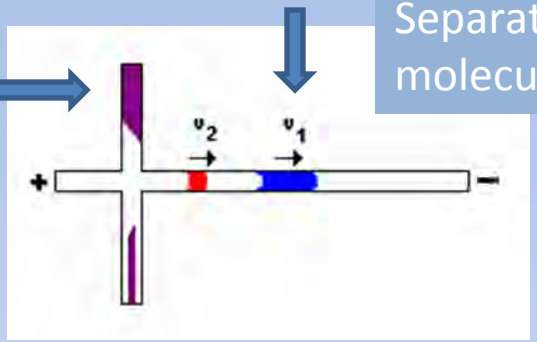
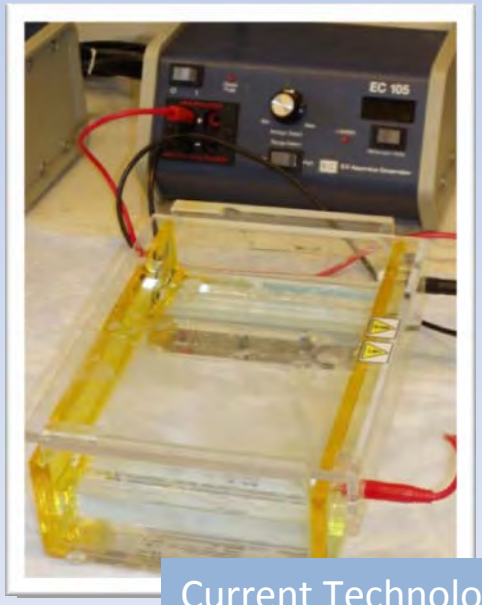
Nanofluidic Technology

- What is nanofluidics?
- How?
  - Biomolecule separation
- Where?
  - Biometric Fingerprinting
  - Forensics
  - Medical Diagnosis
- Why?
  - Small samples
  - Faster Diagnosis
  - Handheld device
  - Onsite analysis



Handheld identification device

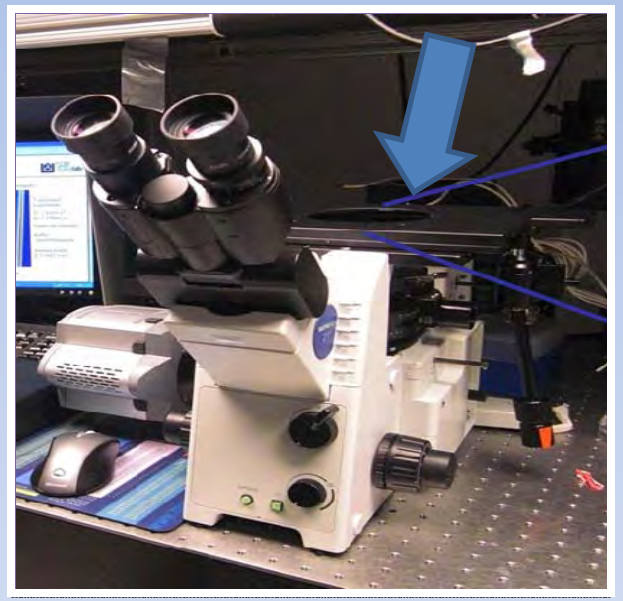


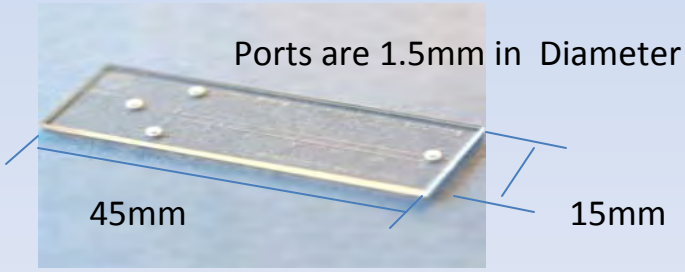
Current Technologies
Gel Electrophoresis

Designing to Interface Laboratory Equipment

- We are still in the Lab
- Objectives
  - Design of holder, various parts
  - Modeling with SolidWorks
  - Supervise fabrication
  - Testing
- Improved experimentation

Microscope Interface

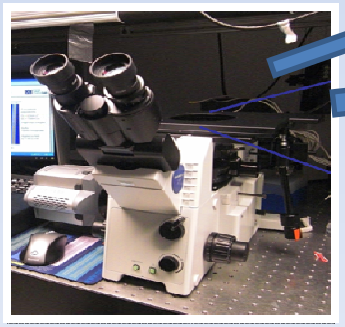




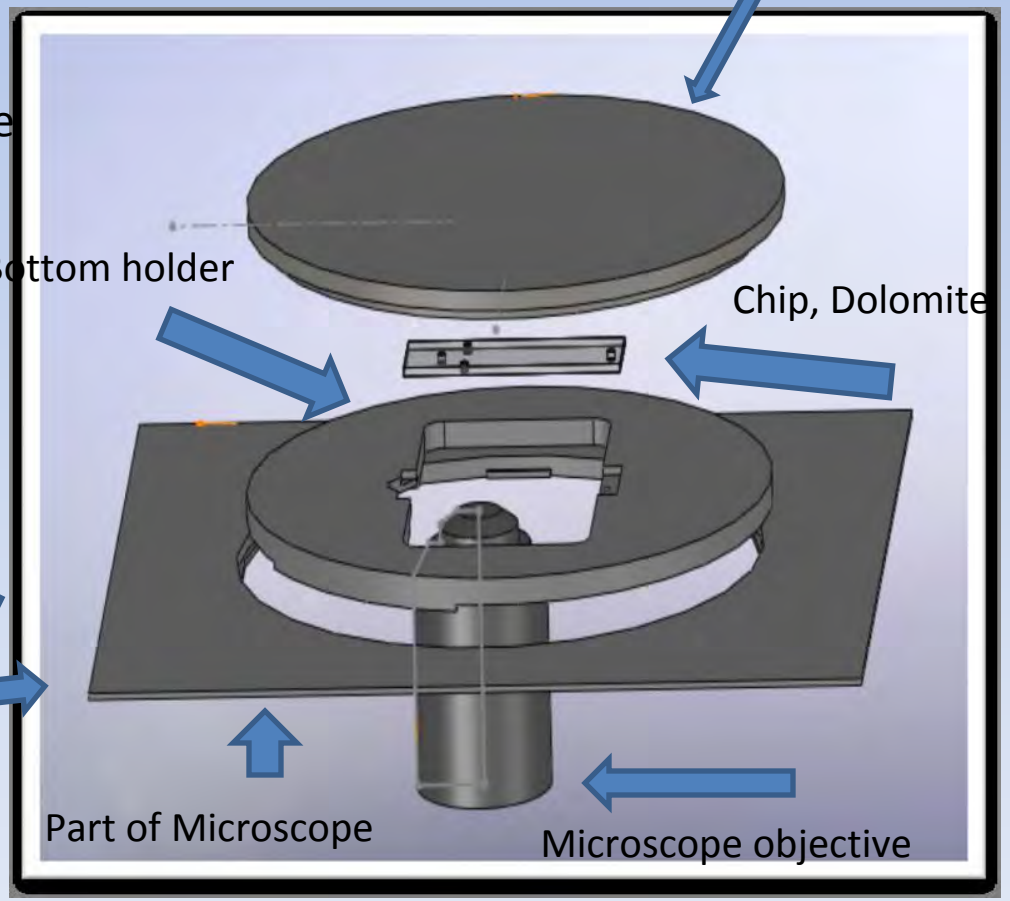
www.dolomite-microfluidics.com

Approach to Forming a Robust Chip Holder

- Problems and Constraints
  - Bottom Piece
    - Tolerances of chips
    - Compatibility with microscope
    - Stop rotation of holder
  - Top piece:
    - non-conductive
    - no reflection
    - Reservoirs (sealing)
- Analysis
- Review



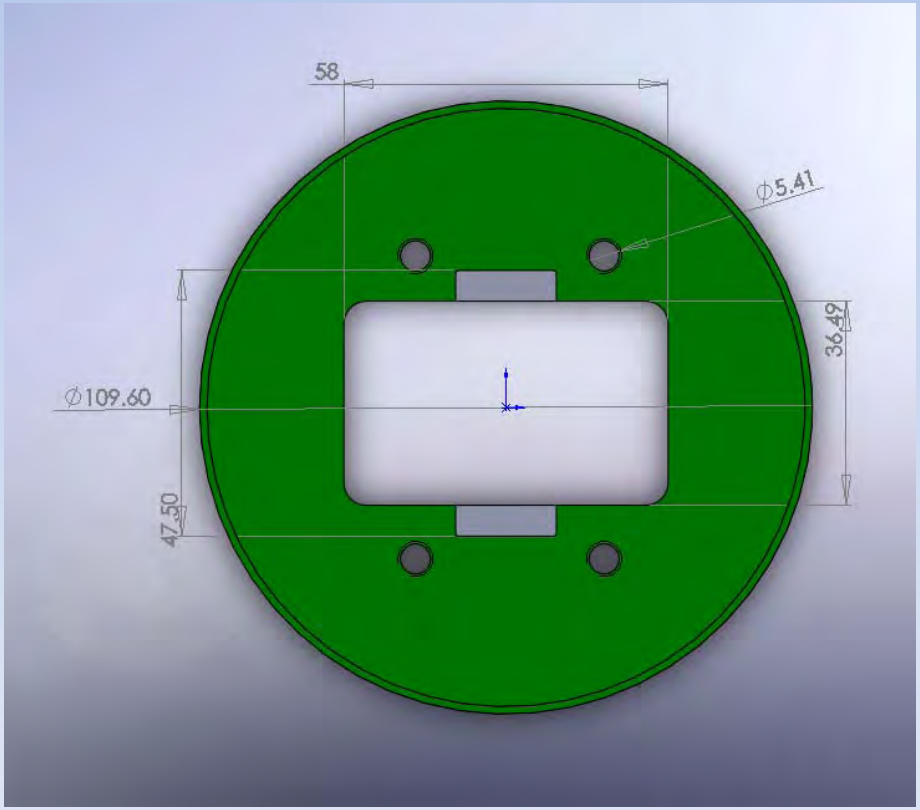
Early models and microscope parts:



From Beginning to End

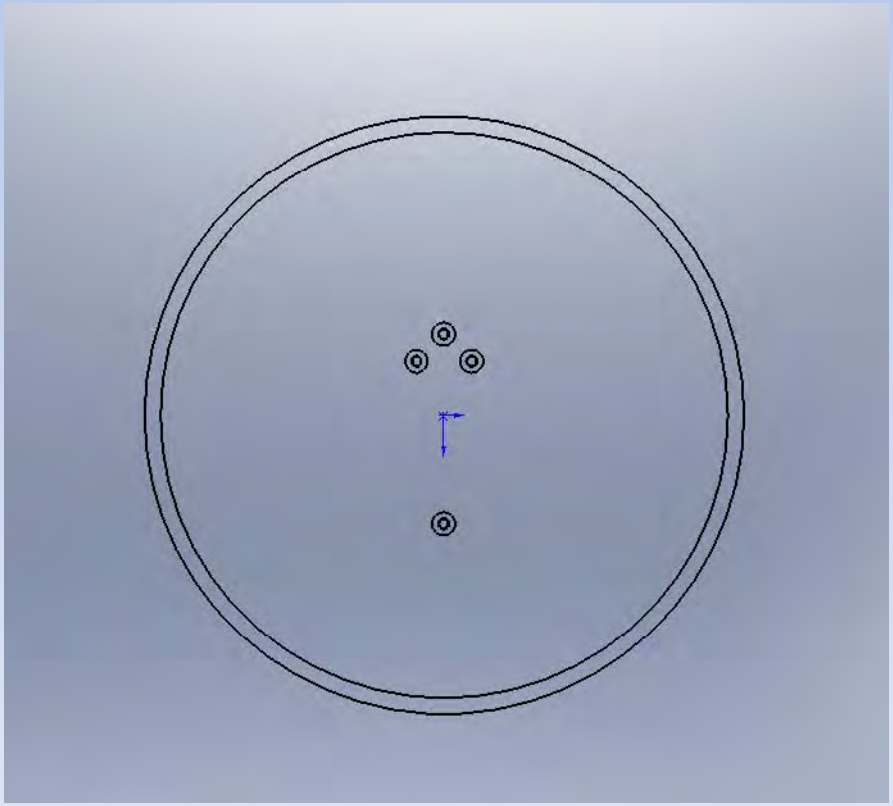
- First Design

- Final Product

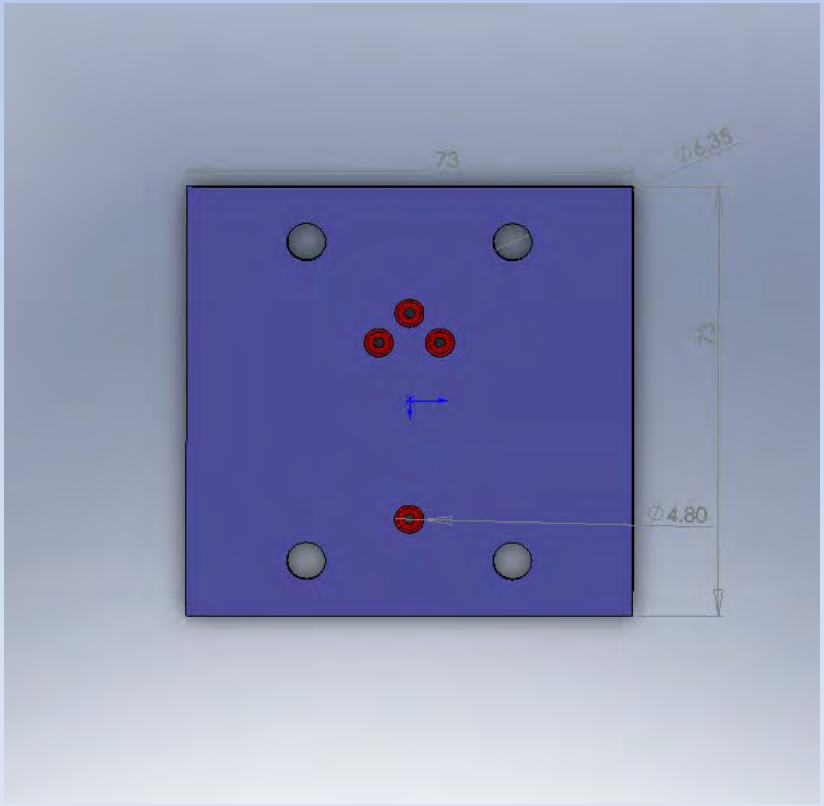


From Beginning to End

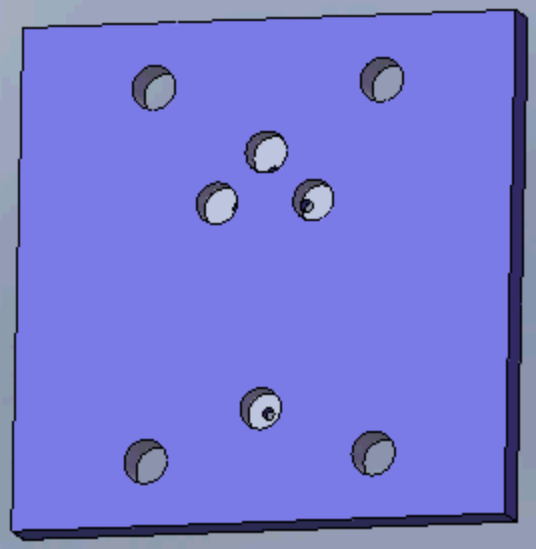
- First Design

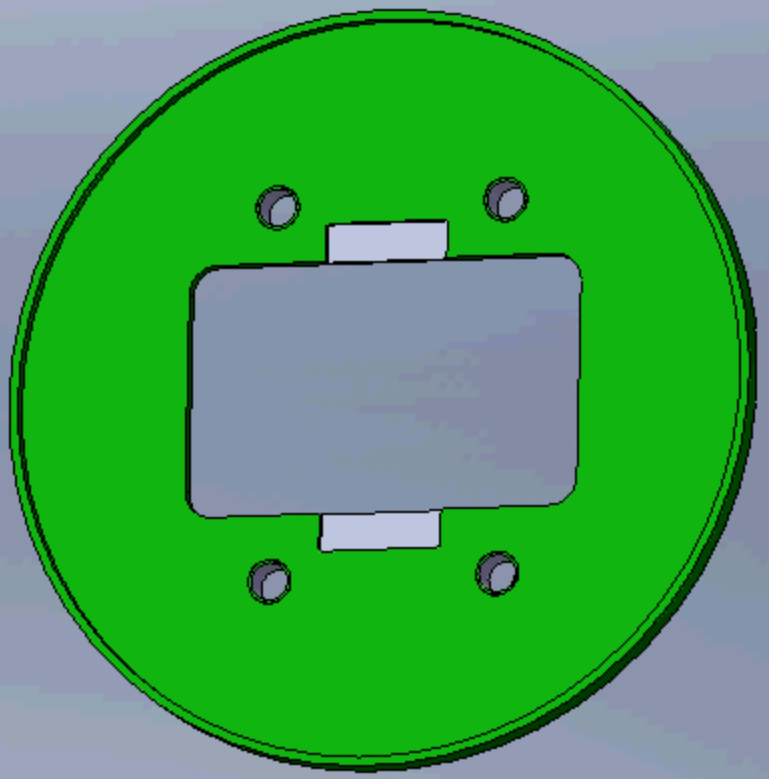


- Final Product

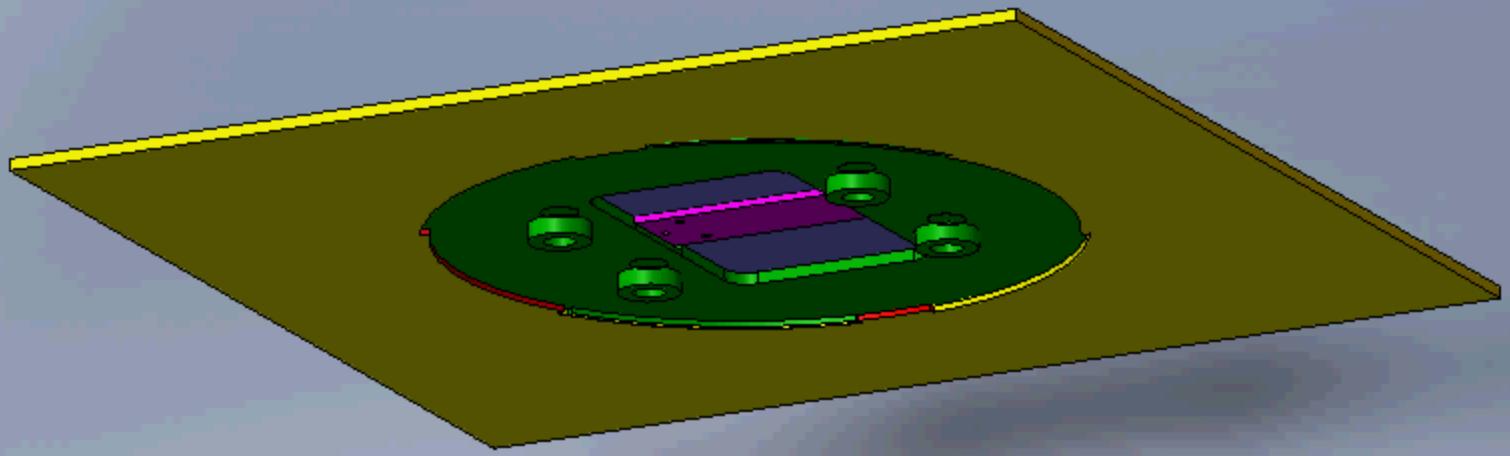


Results From Modeling





Results From Modeling



Success of the Robust Chip Holder

Results Expected

- Placement/Repeatability
- Accessibility of microscope objective
- Availability of solution
- Sealing of O-rings
- Repeatability of data compared to current designs

Learned Skills

- Deeper knowledge of SolidWorks
- O-rings
- Design process
- Laboratory equipment for experimentation
- How to create microchannels in PDMS (Polydimethylsiloxane)

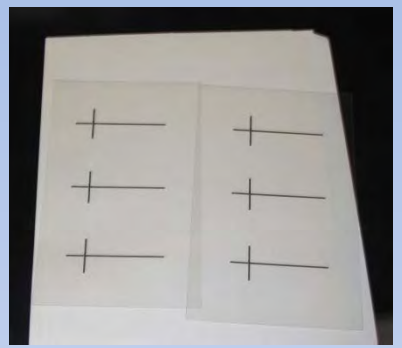
Plans for the Future

- Perform separations
  - In PDMS channels (training)
  - In glass channels
  - In glass channels with chip holder
- Compare results with/without chip holder

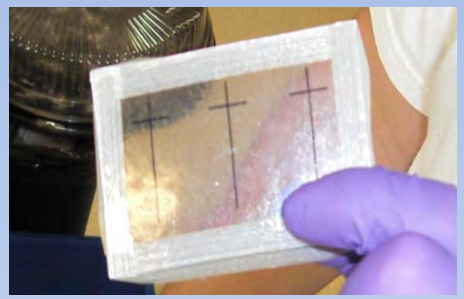
Acknowledgements

- Mentor, Maria Napoli
- Mentor, Tom Wynne
- Faculty Advisor, Sumita Pennathur
- Inset
  - Dr. Nick Arnold
  - Jens Kuhn
  - Ofelia Aguirre

PDMS Microchannels



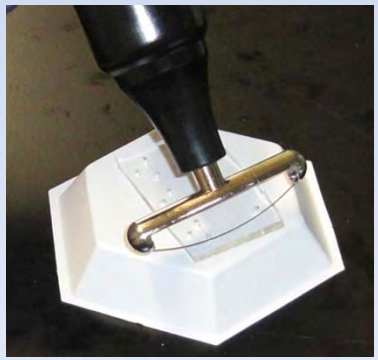
Create mold from shrinky dinks



- Shrinky Dinks
- PDMS (Polydimethylsiloxane) polymer
- Plasma bond to glass
- Micro Channels!

Pour PDMS onto mold and cure

Peel off cured PDMS
Cut holes for ports



Plasma bond
PDMS to glass